

A Comparative Study of Hand Sewn versus Stapler Anastomosis in Elective Gastrointestinal Surgeries

Sandip Kumar Bharai¹, Mineshkumar Sindhal², Priyanka M. Aanandaka^{3*}

¹Assistant Professor, Department of Surgery, M P Shah Government Medical College, Jamnagar, Gujarat, India.

²Assistant Professor, Department of Surgery, All India Institute of Medical Sciences, Rajkot, Gujarat, India

³Senior Resident, Department of Surgery, All India Institute of Medical Sciences, Rajkot, Gujarat, India

Received: 10-12-2023 / Revised: 16-01-2024 / Accepted: 23-02-2024

Corresponding Author: Dr Priyanka M. Aanandaka

Conflict of interest: Nil

Abstract:

Introduction: In the realm of gastrointestinal surgeries, the choice between hand-sewn and stapler anastomosis techniques remains a critical decision for surgeons. Intestinal anastomosis, which establishes communication between segments of the intestine, plays a pivotal role in restoring continuity post-surgery. While hand-sewn anastomosis has long been the conventional approach, stapler devices have emerged as an alternative method offering enhanced precision, reduced operative time, and potentially improved postoperative outcomes. This study aims to provide a comparative analysis of hand-sewn versus stapler anastomosis in elective gastrointestinal surgeries, shedding light on their respective advantages and limitations.

Material and Methods: The study, conducted at the Department of General Surgery, Shree M.P. Shah Govt. Medical College, Jamnagar, spanned 12 months and focused on patients undergoing gastrointestinal surgeries necessitating bowel anastomosis. Patients were categorized into two groups: Group A underwent hand-sewn anastomosis using various sutures, while Group B received stapler anastomosis using different stapling devices. Inclusion criteria comprised patients aged 18 to 80 years undergoing elective gastrointestinal surgeries with written consent. Patients were assessed for various parameters such as procedure time, return of bowel sounds, oral feeding resumption, postoperative stay, and complications. Statistical analysis employed independent samples T-Test and Chi-Square tests for comparison, ensuring robust evaluation of outcomes and techniques.

Results: The study encompassed 40 cases of resection and anastomosis, with 20 patients undergoing hand-sewn anastomosis and the remaining 20 undergoing stapler anastomosis. The observational comparative design allowed for a detailed examination of the outcomes. Among these cases, 10 involved gastrojejunostomy, 14 involved jejunostomy, and 16 involved ileo-colic (right hemicolectomy) procedures. Analysis revealed a trend favoring stapler anastomosis, showcasing shorter operation times, reduced hospital stays, and earlier return to work compared to hand-sewn anastomosis across all three surgery groups. Stapler anastomosis demonstrated advantages such as reduced operation times (ranging from 1.5 to 2.00 hours), shorter hospital stays (ranging from 8.00 to 8.00 days), and earlier return to work (ranging from 2.9 to 4.25 months) in comparison to hand-sewn techniques. Additionally, stapler anastomosis exhibited fewer complications, including lower rates of anastomotic leaks and mortality, highlighting its potential superiority in gastrointestinal surgery.

Conclusion: Our study reveals stapler anastomosis as superior to hand-sewn techniques in gastrointestinal surgeries, offering benefits such as reduced tissue injury, shorter operating times, and quicker recovery.

Keywords: Anastomosis, Hand sewn, Stapler.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Elective gastrointestinal surgeries are intricate procedures aimed at addressing a diverse array of conditions affecting the digestive system, ranging from benign abnormalities to life-threatening malignancies. [1] Central to these surgeries is the restoration of intestinal continuity through the process of intestinal anastomosis, which establishes communication between previously separate portions of the intestine. This crucial surgical step becomes imper-

ative following the removal of pathological segments of the bowel, ensuring the preservation of gastrointestinal function and overall patient well-being. [2]

The evolution of intestinal anastomotic techniques traces back to ancient medical practices, where innovative approaches were employed to achieve bowel continuity. [3] Dating back to 1000 BC, the renowned Sushruta, often referred to as the "Fa-

ther of Indian Surgery," described utilizing black ants for intestinal suturing, marking an early milestone in surgical innovation. [4] Subsequent centuries saw the refinement of anastomotic techniques, with pioneers like Lembert and Halsted in the 18th century laying down foundational principles and methods for intestinal suturing. [5] Paramount among these principles is the creation of a tension-free anastomosis with optimal opposition of bowel edges, facilitated by robust blood supply. [6]

In modern surgical practice, intestinal anastomosis techniques include hand-sewn suturing and the use of surgical staplers, each with distinct advantages. [7] While hand-sewn anastomosis offers versatility and surgeon familiarity, surgical staplers provide enhanced security and efficiency. Factors influencing the choice between the two methods include bowel diameter, accessibility, and surgeon experience. Despite differences, both aim for optimal postoperative outcomes, emphasizing the accurate union of viable bowel ends with minimal tension. [8] Through our comparative study, we seek to provide insights to aid surgical decision-making in elective gastrointestinal surgeries.

Material and Methods

The study was conducted over a 12-month period at the Department of General Surgery, Shree M.P. Shah Govt. Medical College, Jamnagar. Patients undergoing gastrointestinal surgeries requiring bowel anastomosis for various elective procedures were included. Patients were divided into two groups based on the method of closure implemented by the senior surgeon. Group A underwent hand-sewn anastomosis, utilizing suture materials such as 3-0 vicryl, 3-0 silk, and 3-0 PDS. Group B underwent stapler anastomosis, utilizing linear cutting staplers, linear anastomosing staplers, and transverse anastomosing staplers. Data was collected using a preformatted template and analyzed in comparison with existing literature.

Patients admitted for elective gastrointestinal surgeries requiring bowel anastomosis for benign and malignant conditions, aged between 18 and 80 years, and providing written informed consent were included in the study. Patients under 18 years old, those requiring emergency gastrointestinal anastomosis, pregnant individuals, patients undergoing radiotherapy, and those with coagulopathy or on anticoagulation therapy were excluded.

Patients admitted for elective resection and anastomosis underwent thorough clinical examination and diagnostic investigations. Details were recorded in a standardized proforma. Preoperative optimization included controlling anemia, diabetes, and hypertension, standard bowel preparation, and prophylactic antibiotics. Clearance from a physician and cardiologist was obtained, along with preanesthetic clearance. Patients planned for resection and anastomosis were randomly allocated to either hand-sewn or stapler anastomosis. Various parameters including procedure time, return of bowel sounds, resumption of oral feeds, postoperative hospital stay, and complications such as bleeding and anastomotic leak were recorded. Patients were monitored until discharge for complications through clinical examination. Statistical analysis included independent samples T-Test and Chi-Square test to compare mean values and proportions between the two groups, respectively, with significance assessed using p-values.

Results

A prospective study was conducted to compare the outcomes of hand-sewn versus stapled anastomosis in patients undergoing gastrointestinal (GI) surgeries at the Department of General Surgery, Shree M.P. Shah Govt. Medical College, Jamnagar, from July 2022 to June 2023.

Out of 40 cases of resection and anastomosis included in the study, 20 patients underwent hand-sewn anastomosis while the remaining 20 patients underwent stapler anastomosis. The study employed an observational comparative design. In the hand-sewn group, the choice of technique was based on the preference of the operating surgeon. Hand-sewn anastomosis was performed in two layers using 3-0 vicryl and 3-0 silk sutures. Stapler anastomosis utilized various stapling devices including linear cutting staplers, linear staplers, and transverse anastomotic staplers. Among the cases, 10 involved gastrojejunostomy, 14 involved jejunojejunostomy, and 16 involved ileo-colic (right hemicolectomy) procedures.

The majority of patients in both groups fell within the age range of 40 to 80 years. The mean age in the hand-sewn group was 54.63 years, while in the stapler group, it was 56.63 years. Out of the 40 cases studied, 26 patients were male and 14 patients were female.

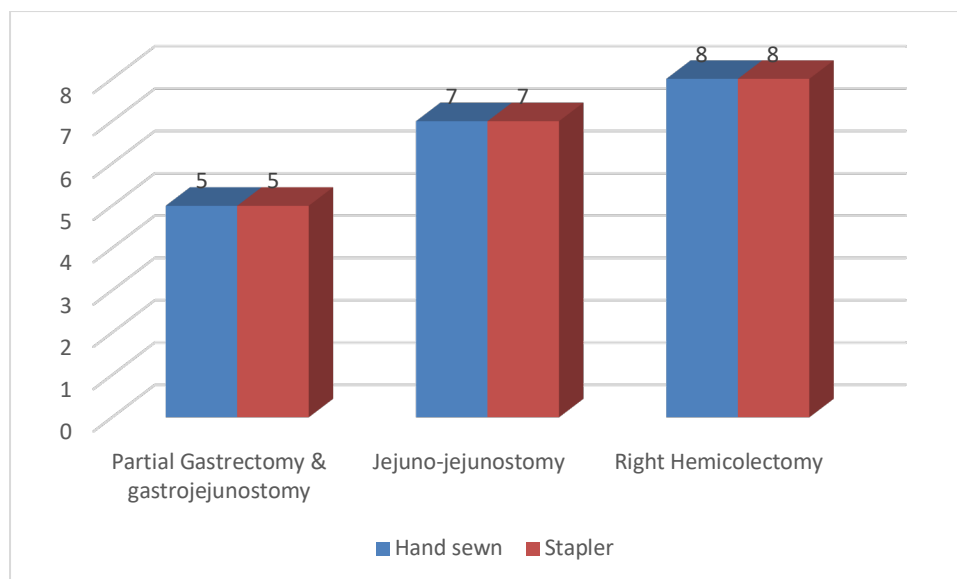


Figure 1: Type of anastomosis among patients (n)

Among the total 10 cases of the gastrojejunostomy group, 5 cases underwent hand-sewn anastomosis, while the other 5 cases underwent stapler anastomosis. Within the 14 cases of the jejuno-jejunostomy group, 7 cases were subjected to hand-sewn anastomosis and 7 cases to stapler anastomosis. In the remaining 16 cases of the ileo-colic group, 8 cases received hand-sewn anastomosis, and 8 cases underwent stapler anastomosis.

In a comparative analysis across three gastrointestinal surgery groups, it was found that stapler anastomosis generally resulted in shorter operation times, shorter hospital stays, and earlier return to work compared to hand-sewn anastomosis. Hand-sewn techniques tended to have longer operation

times, longer hospital stays, and delayed return to work across all three surgery groups. This trend was observed in subtotal gastrectomy & gastrojejunostomy, jejuno-jejunostomy, and ileocolic procedures. Specifically, stapler anastomosis demonstrated advantages such as reduced operation times (ranging from 1.5 to 2.00 hours), shorter hospital stays (ranging from 8.00 to 8.00 days), and earlier return to work (ranging from 2.9 to 4.25 months) across the different surgery groups, while hand-sewn techniques consistently showed longer operation times (ranging from 2.71 to 3.00 hours), longer hospital stays (ranging from 8.00 to 10.17 days), and delayed return to work (ranging from 4.13 to 5.67 months). (Table 1)

Table 1: Comparison of Hand-Sewn vs. Stapler Anastomosis in GI Surgeries

Parameters	Procedure & Method					
	Partial gastrectomy & gastrojejunostomy		Jejuno-jejunostomy		Right hemicolectomy	
	Hand sewn	Stapler	Hand sewn	Stapler	Hand sewn	Stapler
Duration (hours)	2.71	1.93	2.0	1.5	3.0	2.0
Return of bowel sound (days)	2.86	2.13	2.4	2.0	3.17	2.25
Resumption of Feeding (days)	3.14	2.25	3.0	2.5	4.0	2.5
Hospitalization (days)	10.14	8.0	9.5	8.0	10.17	8.0
Return to Work (days)	5.67	4.13	3.5	2.9	4.6	4.2

In present study, the stapler anastomosis showed fewer complications compared to hand-sewn techniques in gastrointestinal surgery (40 cases), with lower rates of anastomotic leaks (1 vs. 3) and mortality (1 vs. 2). (Table 2)

Table 2: Complication Rates between Hand-Sewn and Stapler Anastomosis Techniques

Parameters		Hand sewn	Stapler	Total
Anastomotic Leak	Absent	17	19	36
	Present	3	1	4
Mortality	No	18	19	37
	Yes	2	1	3

Discussion

In our study comparing hand-sewn and stapled anastomosis techniques in gastrointestinal surgeries, we observed similar trends to those reported in Banurekha et al.'s [9] study. Both studies found significant differences favouring stapler anastomosis over hand-sewn techniques in parameters such as duration of procedure, return of bowel sounds, starting of oral feeds, hospitalization days, and return to work, particularly in procedures like subtotal gastrectomy and gastrojejunostomy. This consistency across studies underscores the efficacy of stapler anastomosis in promoting efficiency and patient recovery postoperatively. The reduced operation times associated with stapler anastomosis in our study align with Banurekha et al.'s [9] findings, suggesting that the mechanized approach offers tangible benefits in terms of operative time savings. Additionally, the shorter hospital stays observed in both studies indicate that stapler anastomosis may facilitate faster patient discharge, potentially reducing healthcare costs and improving bed availability. However, while our study and Banurekha et al.'s study highlight the advantages of stapler anastomosis, Mehta et al.'s [10] study presents a nuanced perspective by noting the lack of significant differences in post-operative complications between the two techniques. This suggests that while stapler anastomosis expedites surgery, it maintains comparable safety and efficacy to hand-sewn techniques.

In another way, our study findings resonate with those of Bhandary et al.'s investigation, which emphasizes the benefits of stapling techniques in reducing operative time and tissue trauma, particularly in situations where access is challenging. The reduced tissue handling associated with stapler anastomosis may contribute to faster postoperative recovery and fewer complications, aligning with our observations regarding the shorter hospital stays and earlier return to work in the stapler group. Moreover, Nichkaode et al.'s [11] study underscores the broader applicability of stapler techniques across various gastrointestinal surgeries, highlighting their advantages in early restoration of gastrointestinal function and reduced hospital stay. The versatility of stapler anastomosis, as demonstrated by its efficacy in different surgical contexts, suggests its potential as a standard approach in gastrointestinal surgeries. In contrast, Liu et al.'s [12] study highlighted the superior outcomes of stapler application in gastrointestinal tumor treatment, showcasing benefits such as reduced surgical operation time, faster recovery to normal functions, and lower occurrence of complications compared to hand-sewn anastomosis. This was particularly evident in cases of gastric carcinoma and colorectal cancer. This collective evidence underscores the versatility and

efficacy of stapler anastomosis across different patient populations and surgical contexts, suggesting its potential to improve outcomes and patient recovery in gastrointestinal surgeries.

Accurate approximation of tissues without tension and ensuring adequate blood supply are crucial aspects of surgical anastomosis, whether achieved through suturing or stapling techniques. Staplers have emerged as integral tools in modern surgical practice, offering the capability to cut and staple simultaneously, thereby eliminating the need for clamping and potentially reducing operative time. Despite the higher initial cost associated with staplers, this is often outweighed by the efficiency gains during surgery. In our study, significant reductions in total operating time were observed in the stapler group compared to the handsewn group, evident in both gastrojejunostomy (GJ) and ileocolic procedures. For instance, in the GJ group, the mean operating time was 121.4 minutes for handsewn procedures versus 90 minutes for stapler procedures ($p < 0.001$), while in the ileocolic group, it was 117.7 minutes versus 89.5 minutes, respectively ($p = 0.003$). These findings align with previous research conducted by Brillantino et al. [13], as well as studies by Damesha et al. [14] and George et al. [15], underscoring the consistent trend towards shorter operating times with stapler usage across various surgical subgroups.

A study findings observed in Mehta et al.'s [10] study, where stapler anastomosis significantly reduced the time taken to perform the anastomosis compared to hand-sewn techniques. This echoes the results reported by Rushin et al. [16] and Damesha et al. [14], indicating a consistent trend towards shorter operative times with stapler anastomosis. Furthermore, our study and Mehta et al.'s [10] research both did not find a significant difference in the duration of abstinence from oral feeds post-surgery between the two groups, in line with previous studies by Rushin et al. [16] and Damesha et al. [14]. However, while our study and Mehta et al.'s [10] study did not observe a significant difference in postoperative complications such as anastomotic leak between hand-sewn and stapler groups, this contrasts with the findings reported by Banurekha et al. [9], who noted a significantly decreased mortality rate in the stapler anastomosis group compared to hand-sewn anastomosis. These disparities underscore the complexity of comparing outcomes between these techniques and highlight the importance of considering various factors that may influence postoperative results.

Additionally, when examining the outcomes of stapler versus hand-sewn anastomosis across different studies, it becomes evident that while stapler techniques may offer advantages in terms of reduced operative times, they may not necessarily

translate to significant differences in postoperative complications or mortality rates. For instance, Mehta et al.'s study [10] and our own research both revealed similar trends of shorter operative times with stapler anastomosis, consistent with previous literature. [14,16,17] However, the absence of significant differences in postoperative outcomes such as anastomotic leak or mortality between stapler and hand-sewn groups, as observed in our study and Mehta et al.'s [10] research, aligns with meta-analyses conducted by Lustosa et al. [18] and Cochrane, suggesting comparable safety profiles for both techniques. [9,17] On the other hand, Banurekha et al.'s [9] study reported a contrasting finding of decreased mortality with stapler anastomosis, indicating potential variations in outcomes across different patient populations or surgical contexts. These variations emphasize the importance of individualized decision-making in selecting the appropriate anastomotic technique based on patient-specific factors and surgical considerations.

Despite the comprehensive nature of our study and the valuable insights it provides, there are certain limitations that must be acknowledged. Firstly, the study was conducted at a single center, which may limit the generalizability of our findings to broader populations or diverse surgical settings. Additionally, the sample size was relatively small, potentially limiting the statistical power and precision of our results. Furthermore, as with any observational study, the possibility of confounding factors influencing outcomes cannot be entirely ruled out.

Conclusion

In conclusion, our study has systematically compared the outcomes of gastrointestinal surgeries across various parameters, including the duration of the procedure, return of bowel sound, oral feeding initiation, return to work, hospitalization duration, complications, and mortality rates. Through this comprehensive analysis, it becomes evident that stapler anastomosis emerges as superior to hand-sewn techniques in several aspects. Notably, stapler anastomosis offers advantages such as reduced tissue injury, shorter operating times, earlier recovery of bowel function, prompt initiation of oral feeding, quicker mobilization from bed, decreased hospitalization periods, and earlier return to normal activities. These findings underscore the safety and efficacy of stapler anastomosis, indicating its potential to become an integral part of surgical practice. Surgeons are encouraged to develop proficiency with stapler devices alongside traditional suturing techniques, recognizing the valuable role of both methods in optimizing patient outcomes and enhancing postoperative recovery.

Bibliography

1. Bass BL. What's new in general surgery: gastrointestinal conditions. *J Am Coll Surg.* 2002; 195(6):835–54.
2. Pineda CE, Shelton AA, Hernandez-Boussard T, Morton JM, Welton ML. Mechanical bowel preparation in intestinal surgery: a meta-analysis and review of the literature. *J Gastrointest Surg.* 2008;12(11):2037–44.
3. Tebala GD. History of colorectal surgery: A comprehensive historical review from the ancient Egyptians to the surgical robot. *Int J Colorectal Dis.* 2015;30:723–48.
4. Patwardhan B, Mutalik G, Tillu G. Integrative approaches for health: Biomedical research, Ayurveda and Yoga. Academic Press; 2015.
5. De Moulin D, De Moulin D. The German Period in Dutch Surgery. *Hist Surg Emphas Neth.* 1988;304–28.
6. Hunt SR, Silveira ML. Anastomotic construction. *ASCRS Textb Colon Rectal Surg.* 2016; 141–60.
7. Ho YH, Ashour MAT. Techniques for colorectal anastomosis. *World J Gastroenterol WJG.* 2010;16(13):1610.
8. Vargas HD, Margolin DA. Anastomotic construction. *ASCRS Textb Colon Rectal Surg.* 2022;157–87.
9. Banurekha R, Sadasivam S, Sathyamoorthy K. Hand sewn versus stapler anastomosis in elective gastro intestinal surgeries. *Int Surg J.* 2017;4(7):2316–20.
10. 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(3):399–402.
11. Nichkaode P, Kulshrestha M, Akhtar M, Gurjar G, Zamad R. Comparative study of stapler anastomosis over hand sewn anastomosis in elective gastrointestinal surgeries. *J Evol Med Dent Sci.* 2013;2(19):3408–16.
12. Liu B wei, Liu Y, Liu J ru, Feng Z xu. Comparison of hand-sewn and stapled anastomoses in surgeries of gastrointestinal tumors based on clinical practice of China. *World J Surg Oncol.* 2014;12:1–6.
13. Brillantino A, Sotelo MLS, Cricri AM, Geraci A, Cricri M, Scardi F, et al. Hand-Sewn Versus Stapled Small Bowel Anastomoses in Patients With Secondary Mesenteric Ischemia. *J Surg Res.* 2023;281:52–6.
14. Damesha N, Lubana P, Jain D, Mathur R. A comparative study of sutured and stapled anastomosis in gastrointestinal operations. *Internet J Surg.* 2008;15(2):23–9.
15. George W. Suturing or stapling in gastrointestinal surgery: a prospective randomized study. *Br J Surg.* 1991;78(3):337–41.

16. Thakor RB, Kansal SS, Salecha PA. A comparative study of Hand suture verses Stapler anastomosis Gastrointestinal surgeries. Natl J Med Res. 2014;4(04):354–6.
17. Hori S, Ochiai T, Gunji Y, Hayashi H, Suzuki T. A prospective randomized trial of hand-sutured versus mechanically stapled anastomoses for gastroduodenostomy after distal gastrectomy. Gastric Cancer. 2004;7:24–30.
18. Neutzling CB, Lustosa SA, Proenca IM, da Silva EM, Matos D. Stapled versus handsewn methods for colorectal anastomosis surgery. Cochrane Database Syst Rev. 2012;(2).