

## TO INVESTIGATE THE USE OF STAPLERS IN GUT SURGERY COMPARED TO THE TRADITIONAL HAND-SEWN APPROACH

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### Abstract

**Background:** Intestinal anastomosis is a frequently done surgical procedure in both planned and urgent surgical scenarios whenever tumors of the gastrointestinal tract, whether benign or malignant, are excised or resected. Intestinal anastomosis may be achieved using either hand-sewn or mechanical stapling techniques. **Aim:** To investigate the use of staplers in gut surgery compared to the traditional hand-sewn approach. **Material and Methods:** A comparative analysis was undertaken in the surgery department by reviewing the case records of 60 consecutive patients who had elective gastrointestinal procedures. This research comprised elective gastrointestinal procedures that required anastomosis in individuals aged 14 years and older. Out of the 60 patients in the research, 30 had hand-sewn anastomosis using either a single or double layer, forming the hand-sewn group. The other 30 patients underwent anastomosis using a stapler method, forming the stapler group. **Results:** The research found that the average length of subtotal gastrectomy and gastrojejunostomy was 2.82 hours when performed using hand-sewn techniques, and 2.01 hours when performed with a stapler, with a p-value of 0.01. The study found that the average time for bowel sounds to return after subtotal gastrectomy and gastrojejunostomy was 2.95 days using hand-sewn technique and 2.17 days using stapler method, with a p-value of 0.02. Additionally, the mean duration for starting oral feeding was 3.21 days for hand-sewn method and 2.33 days for stapler method, with a p-value of 0.02. In the hand-sewn group, the average time to begin oral feeding was 4.11 days, whereas in the stapler group it was 2.77 days, with a p-value of 0.03. The average length of hospital stay after subtotal gastrectomy and gastrojejunostomy was 11.01 days for hand-sewn procedures and 7.99 days for stapler techniques, with a statistically significant p-value of 0.03. The research found that the average time to return to work after subtotal gastrectomy and gastrojejunostomy was 5.88 months for hand-sewn procedures and 4.24 months for stapler methods, with a p-value of 0.02. **Conclusion:** The stapler approach greatly shortens the time of surgery, leading to early recovery and reduced fatality rates. Stapling is efficient in hard-to-reach locations such as low colorectal anastomosis. Stapler anastomosis is a safe and successful technique for elective gastrointestinal surgery.

## INTRODUCTION

Intestinal tumors, blockages, and peritonitis resulting from abdominal trauma or perforated colon are often encountered surgical issues that may be addressed with resection and anastomosis.<sup>[1]</sup> This procedure involves connecting two segments of the gut with precise approximations and ensuring a sufficient blood flow to both sections. The anastomotic process significantly influences surgical results. After removing sections of the intestine, the main procedure in gastrointestinal surgery is

connecting the remaining gut loops by anastomosis. Hand-sewn and stapled sutures are commonly used anastomotic techniques in gastrointestinal surgery.<sup>[2,3]</sup> Gastrointestinal surgery mostly relies on the seromuscular suture technique. Matheson of Aberdeen observed that single-layer extra mucosal anastomosis is presently more often used because to its ability to produce less tissue necrosis or luminal constriction, and has largely replaced catgut and silk.<sup>[4]</sup>

Mechanical sutures created by stapler devices are a technological breakthrough that helps in joining

bowel loops together with less tissue damage and a quicker treatment duration.<sup>[5]</sup> Staplers were created to address the issue of patency, namely in anastomoses, by providing protection against leakage of blood or intestinal contents. Many surgeons today commonly use the Stapler technique. Anastomosis performed by machine is superior to hand-stitched anastomosis in terms of safety, accessibility, duration, and effectiveness.<sup>[6]</sup> Many surgeons are skeptical about using the stapler at critical anastomosis locations. In the last three decades, the development of reliable, single-use staplers has significantly transformed surgical procedures. Rare technical issues occur with current devices, and performing anastomosis in hard-to-reach areas is easier.<sup>[7]</sup>

Factors to consider include the duration of anastomosis, restoration of function, achieving adequate hemostasis, minimizing tissue damage, and preventing postoperative complications such as leaks and infections.<sup>[8]</sup> Precise approximation with enough blood flow is crucial for both suturing and stapling procedures. Staplers have been devised to fulfill most of these needs. Randomized studies in colorectal surgery have shown no disparities in leakage rate, duration of hospital stay, or morbidity between these two anastomosis procedures.<sup>[9]</sup> A different study concluded that there were no discernible variations in stricture development, anastomotic hemorrhage, anastomotic time, reoperation rate, mortality rate, or intra-abdominal abscess formation between hand-stitched and stapler-based anastomosis.<sup>[10]</sup> Staplers have the ability to cut and staple at the same time, removing the need for clamping. The increased price of staplers is balanced by their reduced operational duration.<sup>[11]</sup> Circular staplers enhance access during low pelvic surgery, reducing the need for a permanent colostomy in many patients. Anastomosis may be performed by suturing or stapling.<sup>[12]</sup>

## MATERIALS AND METHODS

A comparative analysis was undertaken in the surgery department by reviewing the case records of 60 consecutive patients who had elective gastrointestinal procedures. This research comprised elective gastrointestinal procedures that required anastomosis in individuals aged 14 years and older. The research excluded children under 14 years of age and emergency gastrointestinal procedures. Out of the 60 patients in the research, 30 had hand-sewn anastomosis using either a single or double layer, forming the hand-sewn group. The other 30 patients underwent anastomosis using a stapler method,

forming the stapler group. Anastomosis was performed either side to side or end to end based on factors such as accessibility, anastomotic location, and surgical requirements. Vicryl and Silk were used for hand-sewn anastomosis, while the GI stapler device, which included linear, cutting, and circular varieties, was employed for stapler anastomosis. The study compared the outcomes of hand-sewn anastomosis and stapler anastomosis in elective gastrointestinal surgeries by analyzing parameters such as operating time, return of bowel sounds, initiation of oral feeds, length of hospital stay, time to return to work, anastomotic leak, and mortality.

### Statistical Analysis

The data was statistically analyzed using an independent samples T-test to compare mean values across techniques and Chi-square tests were performed to evaluate the proportions of the two values.

## RESULTS

The research found that patients who had hand-sewn anastomosis had a mean age of  $50.65 \pm 5.36$  years, whereas those who had stapler anastomosis had a mean age of  $48.87 \pm 4.57$  years. The research found that the average length of subtotal gastrectomy and gastrojejunostomy was 2.82 hours when performed using hand-sewn techniques, and 2.01 hours when performed with a stapler, with a p-value of 0.01. The study found that the average time for bowel sounds to return after subtotal gastrectomy and gastrojejunostomy was 2.95 days using hand-sewn technique and 2.17 days using stapler method, with a p-value of 0.02. Additionally, the mean duration for starting oral feeding was 3.21 days for hand-sewn method and 2.33 days for stapler method, with a p-value of 0.02. In the hand-sewn group, the average time to begin oral feeding was 4.11 days, whereas in the stapler group it was 2.77 days, with a p-value of 0.03. The average length of hospital stay after subtotal gastrectomy and gastrojejunostomy was 11.01 days for hand-sewn procedures and 7.99 days for stapler techniques, with a statistically significant p-value of 0.03. The research found that the average time to return to work after subtotal gastrectomy and gastrojejunostomy was 5.88 months for hand-sewn procedures and 4.24 months for stapler methods, with a p-value of 0.02.

Out of 60 patients, 14 had anastomotic leak. Among them, 9 underwent hand-sewn anastomosis and 5 had stapler anastomosis. Mortality occurred in 4 patients who had hand-sewn anastomosis, whereas no deaths were reported in the stapler anastomosis group. The findings are shown in Table 3. [Table 3]

**Table 1: Gender and age of the participants**

Gender	Number	Percentage
Male	39	65
Female	21	35
Age		

Below 20	6	10
20-30	9	15
30-40	13	21.67
40-50	20	33.33
Above 50	2	3.33
Mean Age	49.34±6.43	

**Table 2: Comparison of various parameters**

	Hand sewn		Stapler		P value
	Mean	Sd	Mean	Sd	
<b>Duration of procedure</b>	2.82	0.65	2.01	0.69	0.01
<b>Return of bowel sounds</b>	2.95	0.54	2.17	0.67	0.02
<b>Day of starting oral feeds</b>	3.21	0.67	2.33	0.77	0.02
<b>Hospitalization in days</b>	11.01	1.15	7.99	1.54	0.03
<b>Return to work in months</b>	5.88	1.07	4.24	1.11	0.02
<b>Right hemicolectomy group</b>					
Duration of procedure	3.04	0.76	3.25	0.76	0.01
Return of bowel sounds	3.29	0.45	2.37	0.57	0.13
Day of starting oral feeds	4.11	0.76	2.77	0.79	0.03
Hospitalization in days	10.28	1.44	8.11	1.33	0.01
Return to work in months	5.01	1.16	4.44	1.16	0.15
<b>Low anterior resection group</b>					
Duration of procedure	2.77	0.88	1.89	0.34	0.01
Return of bowel sounds	3.14	0.56	2.47	0.46	0.02
Day of starting oral feeds	3.49	0.77	3.12	0.55	0.11
Hospitalization in days	9.04	1.45	8.01	1.22	0.02
Return to work in months	6.08	1.34	4.39	1.25	0.01
<b>Other resection and anastomoses group</b>					
Duration of procedure	3.22	0.76	2.45	0.87	0.02
Return of bowel sounds	3.22	0.72	2.77	0.84	0.12
Day of starting oral feeds	3.66	0.86	3.07	0.68	0.01
Hospitalization in days	9.71	1.58	8.42	1.46	0.03
Return to work in months	5.31	1.76	4.07	1.67	0.01

**Table 3: Comparison of anastomotic leak, mortality in hand sewn and stapler anastomosis in gastrointestinal surgeries**

	Anastomosis						P value
	Hand sewn		Stapler		Total		
<b>Anastomotic leak</b>	Number	Percentage	Number	Percentage	Number	Percentage	<b>0.06</b>
Absent	21	70	25	83.33	46	76.67	
Present	9	30	5	16.67	14	23.33	
<b>Mortality</b>							<b>0.07</b>
No	26	86.67	30	100	56	93.33	
Yes	4	13.33	0	0	4	6.67	

## DISCUSSION

Surgical stapling was first presented by Hülthl in 1908, but its use has increased with the advent of new disposable devices in the last 35 years. Multiple studies show similar findings regarding the length of the surgery, anastomotic leak rates, and death.<sup>[13]</sup> Matos conducted a comprehensive assessment of nine studies with a total of 1233 patients (622 had stapled procedures and 611 underwent hand-sewn procedures) and observed leak rates of 13% and 13.4% respectively. The clinical comparison showed a difference of 0.8% (6.3% vs. 7.1%), whereas the radiological comparison showed a difference of 0.6% (7.8% vs. 7.2%). There was not enough data to prove the superiority of either approach. The choice of approach should be based on past experience, clinical factors, and the availability of radiological resources. Using stapling equipment for infra-peritoneal colorectal anastomosis is not suggested because to a greater incidence of strictures, despite

the surgery being quicker and having fewer cases of anastomotic leakage. According to the statistics, there was a dispute among the surgeons on whether to use hand-sewn or stapler anastomosis.<sup>[14]</sup> Comparing parameters such as age, procedure duration, return of bowel sounds, initiation of oral feeds, hospital stay duration, return to work time, anastomotic leak, and mortality between hand-sewn and stapler anastomosis in four different gastrointestinal surgery groups: subtotal gastrectomy and gastrojejunostomy, right hemicolectomy, low anterior resection, and other intestinal resection and anastomosis.

The research found that patients who had hand-sewn anastomosis had a mean age of 50.65±5.36 years, while those who had stapler anastomosis had a mean age of 48.87±4.57 years. In the Scher study, the average age of patients was 54.6 years for hand-sewn anastomosis and 58.6 years for stapler anastomosis.<sup>[15]</sup> The Reiling research found that the average age of those using hand sewing was 55.1

years, while those using a stapler was 56.8 years, with the latter group having a higher average age in both cases.<sup>[16]</sup>

The mean duration of subtotal gastrectomy and gastrojejunostomy was 2.82 hours when performed using hand-sewn technique, and 2.01 hours when performed using a stapler, with a p-value of 0.01. Scher's research found no significant variation in the length of the surgery for subtotal gastrectomy. The hand-sewn version lasted for 156 minutes, while the stapled version lasted for 157 minutes.<sup>[15]</sup> The Reiling study also showed no difference whereas Rushin study showed a statically significant difference in favour of stapler group.<sup>[16,17]</sup>

The average duration of right hemicolectomy was 3.04 hours for hand-sewn and 3.25 hours for stapler techniques, with a statistically significant p-value of 0.01. This finding contrasts with the Scher and Reiling studies, while the Rushin and Damesha studies agreed significantly on the mean operating time for right hemicolectomy.<sup>[15-18]</sup> The average duration of low anterior resection was 2.77 hours with hand-sewn technique and 1.89 hours with stapler technique, with a p-value of 0.01. Adloff's research found that there was no significant difference in the time duration between the hand-sewn approach, which took 180 minutes, and the stapler technique, which took 176 minutes.<sup>[19]</sup> The research by Scher found that the hand-sewn approach took 186 minutes, whereas the stapler technique took 209 minutes, with the stapler method requiring more time. The average length of the resection and anastomosis procedure was 3.22 hours for hand-sewn and 2.45 hours for stapler techniques, with a p-value of 0.02.<sup>[15]</sup>

The study found that the mean time for the return of bowel sounds after subtotal gastrectomy and gastrojejunostomy was 2.95 days with hand-sewn closure and 2.17 days with stapler closure, with a p-value of 0.02. The mean duration for starting oral feeding was 3.21 days with hand-sewn closure and 2.33 days with stapler closure, with a p-value of 0.02. These results contrast with the Scher study, which indicated that the sutured technique was superior to the stapler method. The Rushin research supported our findings, but the Damesha study did not uncover any significant results. In our research on right hemicolectomy, the average time for the recovery of bowel sounds was 3.29 days for hand-sewn procedures and 2.37 days for stapler procedures, with a p-value of 0.13.

In the hand-sewn group, the average time for oral feeding was 4.11 days, while in the stapler group it was 2.77 days, with a p-value of 0.03. This aligns with the findings of Rushin and Damesha. In contrast, Scher's study indicated no significant difference between the two groups, with times of 3.7 days for hand-sewn and 3.8 days for stapler methods.

The average time for bowel sounds to be heard in the low anterior resection group was 3.14 days with hand-sewn closure and 2.47 days with stapler

closure, yielding a p-value of 0.02. The average day to initiate oral feeding was 3.49 days in the hand-sewn group and 3.12 days in the stapling method group, with a p-value of 0.11. Both the Scher research and the Adloff study found no meaningful difference between the two procedures in low anterior resection. In our research, the average time for the recovery of bowel sounds was 3.22 days in the hand-sewn group and 2.77 days in the stapler group, with a p-value of 0.01.<sup>[15,19]</sup>

The average length of hospital stay after subtotal gastrectomy and gastrojejunostomy was 11.01 days for hand-sewn procedures and 7.99 days for stapler techniques, with a p-value of 0.03. However, a study by Reiling, Scher, Rushin, and Damesha did not find any significant differences in their research.<sup>[15-18]</sup> The average length of hospital stay after right hemicolectomy was 10.28 days for hand-sewn procedures and 8.11 days for stapler methods, with a p-value of 0.01. This finding aligns with Reiling and Scher's research, but Damesha's study reported no significant differences. The average length of hospital stay was 9.04 days for the hand-sewn technique and 8.01 days for the stapler approach in low anterior resection, with a statistically significant p-value of 0.02.<sup>[15,17,18]</sup>

Adloff's research found no disparity in hospitalization rates between the two approaches, whereas Scher's investigation identified negligible variations.<sup>[15,19]</sup> The average length of hospital stay was 9.71 days for the hand-sewn approach and 8.42 days for the stapler method in our research on resection and anastomosis. The p-value was 0.002.

The research found that the average time to return to work after subtotal gastrectomy and gastrojejunostomy was 5.88 months for hand-sewn procedures and 4.24 months for stapler methods. The p-value of 0.02 indicates a statistically significant difference, aligning with the findings of the Scher and Reiling study. The average time to return to work was 5.01 months for the hand-sewn approach and 4.44 months for the stapler method in the right hemicolectomy group, with a p-value of 0.15. The average time to return to work was 6.08 months for the hand-sewn group and 4.39 months for the stapler group in the low anterior resection trial. The p-value was 0.01, consistent with the findings of the Scher and Reiling research.<sup>[15,17]</sup> The average time to return to work was 5.31 months for hand-sewn anastomosis and 4.07 months for stapler anastomosis, with a p-value of 0.01. Out of the 14 patients in the research, 9 had hand-sewn anastomosis whereas 5 got stapler anastomosis. The p-value associated with this comparison was 0.06. Anastomotic leak rates were 2.1% for hand-sewn anastomosis and 2.9% for stapled anastomosis in the Scher trial, with no statistically significant difference between the two procedures.<sup>8</sup> Reiling, Rushin, Damesha, and Adloff also determined that there was no substantial difference in anastomotic leak rates between the two procedures.<sup>[16-19]</sup> Four patients who underwent hand-sewn anastomosis

died, but no deaths occurred in patients with stapler anastomosis.

## CONCLUSION

The stapler connection showed a statistically significant reduction in operating time, early recovery of bowel sounds (except for low anterior resection and other resection and anastomosis group), early initiation of oral feeds, reduced hospitalization days, and early resumption of normal daily activities. Stapler anastomosis showed a significant reduction in mortality compared to hand-sewn anastomosis. Stapling procedures are faster to conduct, especially in hard-to-reach areas such as low colorectal anastomosis. Recent advancements in current stapler devices have made stapler anastomosis a safe and successful technique in gastrointestinal procedures. It is important for surgeons to be proficient in using both a stapler gun and a needle holder with sutures.

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