Original Article

Comparative Study of Stoma Closure by Stapler Technique versus Conventional Suture Anastomosis

Nitesh Bisht[1], Vipin Kumar[2], Chandra Kishor Jakhmola[3]

[1]PG Resident, Department of General Surgery, Teerthanker Mahaveer College & Research Centre, Moradabad, India. [2]Professor, Department of General Surgery, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, India. [3]Professor, Department of General Surgery, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, India.

Abstract

Background: Closure of temporary stomas, such as loop ileostomy and colostomy, is a key restorative procedure in colorectal surgery. Traditionally performed by hand-sewn anastomosis, mechanical stapling is an alternative that may reduce morbidity, operative time, and recovery period. Therefore, the aim of study is to compare stapler and conventional hand-sewn techniques for stoma closure in terms of operative outcomes, complication rates, and hospital stay, in order to identify the superior short-term approach. **Material and Methods:** This prospective randomised controlled trial included 70 adult patients undergoing loop ileostomy or colostomy closure, allocated equally to stapler or hand-sewn groups. Outcomes analysed were morbidity, mortality, ileus/small bowel obstruction, anastomotic leak, surgical site infection, bleeding, reoperation, and hospital stay. **Results:** Overall morbidity was significantly lower in the stapler group (5.7%) compared with the hand-sewn group (25.7%, $p = 0.002$). Wound infection (5.7% vs 25.7%, $p = 0.022$) and anastomotic leak (0% vs 5.7%, $p = 0.040$) were less frequent in the stapler group. No mortality occurred. Stapler patients had a shorter mean hospital stay (7.0 ± 0.84 days) compared to hand-sewn patients (11.2 ± 0.76 days, $p = 0.043$). **Conclusion:** Stapler closure of stomas offers reduced morbidity, wound infection, and hospital stay compared to the hand-sewn technique, and should be considered when anatomy and resources allow.

Keywords: Stapler Anastomosis; Hand-Sewn Anastomosis; Stoma Closure; Ileostomy Reversal; Colostomy Reversal; Surgical Site Infection; Hospital Stay.

Received: 02 May 2025 **Revised: 12 July 2025** **Accepted: 19 August 2025** **Published: 30 August 2025**

Introduction

Temporary stomas, such as loop ileostomies and loop colostomies, are frequently used to divert faecal flow to protect distal anastomoses or manage complications such as obstruction, perforation, or trauma.[1]

Once the primary pathology is resolved, closure of the stoma is undertaken to restore bowel continuity and improve quality of life.

Historically, hand-sewn techniques — originating from descriptions in the Sushruta Samhita,[2] refined by Lembert,[3] and Halsted,[4] — have been the standard. Surgical staplers, introduced in the 20th century,[5-7] allow for rapid, uniform closure, reduced tissue handling, and improved access.[8]

Multiple trials and meta-analyses,[10-15] have shown stapler closure to reduce small bowel obstruction, wound infection, and length of stay. Concerns exist over cost and staple-line strictures.[9] This study prospectively compares stapler versus hand-sewn closure.

Materials and Methods

Study Design: Prospective, randomised controlled trial over 15 months in the Department of General Surgery, TMMC&RC, Moradabad.

Sample Size Calculation: Calculated from previous studies using the formula:

$$n = \frac{(\sigma_1^2 + \sigma_2^2)\ [Z_{1-\alpha/2} + Z_{1-\beta}]^2}{(\bar{x}_1 - \bar{x}_2)^2}$$

Where:

n = sample size per group

σ_1, σ_2 = SD of the two groups

$\bar{X}_1$, $\bar{X}_2$ = mean values

$Z_{1-\alpha/2}$ = standard normal variate (CI 95%)

$Z_{1-\beta}$ = standard normal variate (power)

This gave 35 patients per group (total 70).

Randomisation:

Computer-generated list in sealed envelopes:

- Group 1: Hand-sewn anastomosis
- Group 2: Stapler anastomosis

Inclusion Criteria

- Adults 18–80 years
- Suitable for planned stoma closure

Address for correspondence: Dr. Nitesh Bisht, Department of General Surgery, Teerthanker Mahaveer Medical College & Research Centre, Moradabad, India. E-mail:niteshbisht74@gmail.com

DOI:
10.21276/amit.2025.v12.i2.18

How to cite this article: Bisht N, Kumar V, Jakhmola CK. Comparative Study of Stoma Closure by Stapler Technique versus Conventional Suture Anastomosis. Acta Med Int. 2025;12:96-99.

Exclusion Criteria

- Untreated tuberculosis
- Immunosuppressed
- Chronic renal/hepatic/cardiac disease
- Permanent stoma

Preoperative Assessment

Full examination, CBC, LFT, KFT, viral markers, urinalysis, imaging (USG ± loopogram).

Technique

- Hand-sewn: single/double layer polyglactin or silk.
- Stapler: side-to-side using linear cutting stapler, enterotomy stapled closed.

Outcomes: Morbidity, mortality, ileus/SBO, leak/fistula, SSI, bleeding, reoperation, hospital stay.

Analysis: SPSS v20; χ^2 for categorical variables, t-test for continuous; $p<0.05$ significant.

Results

A total of seventy patients were randomised equally to each group. [Table 1] shows demographics. Mean age was 35.91 ± 15.44 years (majority aged 20–30, 35.7%), with 72.9% male. Stomas were most often created after exploratory laparotomy (57.1%). Ileostomy reversals comprised 95.7% of cases.

Overall morbidity [Table 2] was significantly lower in the stapler group (5.7%) than in the hand-sewn group (25.7%, $p = 0.002$). Mortality [Table 3] was nil in both groups. Ileus/SBO [Table 4] affected only 1 patient (2.9%) in the hand-sewn group. Anastomotic leaks [Table 5] occurred in 2 hand-sewn patients (5.7%) and in none of the stapler group ($p = 0.040$).

Complications [Table 6] such as wound infection were higher in the hand-sewn arm (25.7% vs 5.7%, $p = 0.022$). Bleeding and reoperation occurred only in hand-sewn patients. Mean hospital stay [Table 7] was significantly shorter for stapler patients (7.0 ± 0.84 days) compared to hand-sewn (11.2 ± 0.76 days, $p = 0.043$).

Table 1: Demographic data

Parameter		Frequency (n)	Percentage (%)
Age groups (yrs)	<20	9	12.85714
	20-30	25	35.71429
	31-40	12	17.14286
	41-50	11	15.71429
	51-60	7	10
	>60	6	8.571429
Mean age±SD (yrs)		35.91±15.44	
Gender	Female	19	27.1
	Male	51	72.9
Diagnosis	Exploratory Laparotomy	40	57.14286
	Ileostomy	25	35.71429
	Perforation	5	7.142857
Procedure	Colostomy Reversal	3	4.3
	Ileostomy Reversal	67	95.7
Anastomosis	Hand-sewn anastomosis	35	50
	Stapler anastomosis	35	50
Total		70	100

Table 2: Comparison of both the groups in relation to Morbidity

Morbidity	Group 1 (Hand Sewn Anastomosis)		Group 2 (Stapler Anastomosis)	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
No	26	74.3	33	94.3
Yes	9	25.7	2	5.7
Total	35	100.0	35	100.0
x2	2.007			
p-value	0.002*			

Table 3: Mortality

Mortality	Group 1 (Hand Sewn Anastomosis)		Group 2 (Stapler Anastomosis)	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
No	35	100.0	35	100.0
Yes	0	0	0	0
Total	35	100.0	35	100.0

Table 4: Ileus/small bowel obstruction

Ileus/small bowel obstruction	Group 1 (Hand Sewn Anastomosis)		Group 2 (Stapler Anastomosis)	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
No	34	97.1	35	100.0
Yes	1	2.9	0	0
Total	35	100.0	35	100.0
x2	3.667			
p-value	0.056*			

Table 5: Anastomotic leak/ enterocutenous fistula

Anastomotic leak/ enterocutenous fistula	Group 1 (Hand Sewn Anastomosis)		Group 2 (Stapler Anastomosis)	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
No	33	94.3	35	100.0
Yes	2	5.7	0	0
Total	35	100.0	35	100.0
x2	2.615			
p-value	0.040*			

Table 6: Complications

Complications	Group 1 (Hand Sewn Anastomosis)		Group 2 (Stapler Anastomosis)	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Pelvic sepsis	0	0	0	0
Wound infection	9	25.7	2	5.7
Bleeding	1	2.9	0	0
Re-operation	2	5.7	0	0
Total	35	100.0	35	100.0
X2	1.123			
p-value	0.022*			

Table 7: Hospital stay

Hospital stay	Group 1 (Hand Sewn Anastomosis)		Group 2 (Stapler Anastomosis)	
	Mean	SD	Mean	SD
	11.2000	.75926	7.0000	.84017
t-test	1.889			
p-value	0.043*			

Discussion

This study confirms that stapler closure of stomas is associated with significantly reduced postoperative morbidity and shorter hospital stay compared to conventional hand-sewn anastomosis. Our results correspond with those of Hasegawa et al,[10] and Gong et al,[12] who reported lower small-bowel obstruction rates, fewer infections, and shorter recovery periods with stapled methods.

The reduction in morbidity with staplers may be attributed to uniform tissue approximation, minimal bowel handling, and decreased operative time[8]. Although meta-analyses,[13,14] suggest similar leak rates between techniques, in our series leaks occurred only in the hand-sewn group. Hospital stay in stapler patients was around four days shorter — consistent with other RCTs and systematic reviews.[10-15]

While staplers have an initial cost, savings may be seen through fewer complications and shorter admissions. However, technical limitations, such as use in cases of bowel oedema or luminal mismatch, must be recognised, and proficiency in both techniques remains essential.

Conclusion

Stoma closure using stapler anastomosis offers clear advantages in reducing morbidity, complications, and hospital stay, and is supported by current evidence as the preferred technique when anatomy and resources permit. The conventional hand-sewn method remains useful in cases of friable bowel, luminal discrepancy, or cost constraints.Future large-scale, multicentre studies incorporating cost–benefit analysis, long-term anastomotic stricture rates, and patient-reported quality-of-life outcomes are needed. Until then, surgical judgment — informed by patient factors, intra-operative findings, and resource availability — should guide the choice of technique.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Nelson T, Pranavi AR, Sureshkumar S, Sreenath GS, Kate V. Early versus conventional stoma closure following bowel surgery: A randomized controlled trial. Saudi J Gastroenterol. 2018;24(1):52-58.
2. Singh RK, Vyas MK. Surgical procedures in Sushruta Samhita. Int J Res Ayurveda Pharm. 2011;2(5):1444-50.
3. Lembert A. Memoire sur l'enteroraphie avec la description d'un procede nouveau pour pratiquer cette operation chirurgicale. Rep Gen Anat Physiol Path. 1826;2:100-7.
4. Halsted WS. Circular suture of the intestine: an experimental study. Am J Med Sci. 1887;94:436-61.
5. Akopov A, Artioukh DY, Molnar TF. Surgical Staplers: The History of Conception and Adoption. Ann Thorac Surg. 2021;112(5):1716-21.
6. Gaidry AD, Tremblay L, Nakayama D, Ignacio RC Jr. The History of Surgical Staplers: A Combination of Hungarian, Russian, and American Innovation. Am Surg. 2019;85(6):563-6.
7. Von Petz A. Zur Technik der Magenressektion. Ein neuer Magendarmnahapparat. Zentralbl Chir. 1924;51:179-88.
8. 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.
9. Lim CB, Goldin RD, Darzi A, et al. Characterization of materials eliciting foreign body reaction in stapled human gastrointestinal anastomoses. Br J Surg. 2008;95(8):1044-50.

10. Hasegawa H, Radley S, Morton DG, Keighley MR. Stapled versus sutured closure of loop ileostomy: a randomized controlled trial. Ann Surg. 2000;231(2):202-4.
11. Balik E, Eren T, Bugra D, Buyukuncu Y, Akyuz A, Yamaner S. Revisiting stapled and handsewn loop ileostomy closures: a large retrospective series. Clinics (Sao Paulo). 2011;66(11):1935-41.
12. Gong J, Guo Z, Li Y, Gu L, Zhu W, Li J, Li N. Stapled vs hand suture closure of loop ileostomy: a meta-analysis. Colorectal Dis. 2013;15(10):e561-8.
13. Dinc B, Ay N, Ciyiltepe H. Comparing methods of ileostomy closure constructed in colorectal surgery in Turkey. Prz Gastroenterol. 2014;9(5):291-6.
14. Markides GA, Wijetunga IU, Brown SR, Anwar S. Meta-analysis of handsewn versus stapled reversal of loop ileostomy. ANZ J Surg. 2014;84(6):407-13.
15. Löffler T, Rossion I, Goossen K, Saure D, Weitz J, Ulrich A, Büchler MW, Diener MK. Hand suture versus stapler for closure of loop ileostomy – a systematic review and meta-analysis of randomized controlled trials. Langenbecks Arch Surg. 2015;400(2):193-205.