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COMPARISON OF SURGICAL OUTCOME OF LINEAR STAPLED AND MANUAL ANASTOMOSIS TECHNIQUE FOR REVERSAL OF LOOP ILEOSTOMIES

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Abstract:
Background: We designed this study to evaluate how linear-stapled versus hand-sewn anastomosis affects outcomes and resource use after loop ileostomy reversal. Although reversing a protective ileostomy restores bowel continuity, it can lead to surgical-site infections, anastomotic leaks, and extended hospital stays. **Methods:** We reviewed records for 68 adult patients who underwent elective loop ileostomy reversal between 1st July 2024 to 1st January 2025 in the Department of Surgery at Jinnah Postgraduate Medical Centre (JPMC), Karachi. Surgeons chose either a linear stapler (Group A, n = 34) or a two-layer hand-sewn technique (Group B, n = 34). We recorded demographics, comorbidities (diabetes, hypertension, dyslipidemia, smoking), and socioeconomic data (employment, income, education). We defined prolonged hospitalization as a stay longer than seven days. We used Student's t-test to compare mean age, operative time, and length of stay, and applied chi-square or Fisher's exact tests for categorical outcomes (surgical-site infection, anastomotic leak, prolonged stay). We considered $p < 0.05$ significant. **Results:** Both groups showed similar mean ages (45.8 ± 9.2 vs. 47.6 ± 7.4 years; $p = 0.34$) and comparable rates of male sex (52.9% vs. 35.3%; $p = 0.12$), diabetes (50% each; $p = 1.00$), hypertension (52.9% vs. 58.8%; $p = 0.99$), dyslipidemia (58.8% vs. 61.8%; $p = 0.06$), and smoking (38.2% vs. 29.4%; $p = 0.41$). We found that stapled closures took significantly less time (1.7 ± 0.57 vs. 1.9 ± 0.99 hours; $p = 0.04$). Mean hospital stay did not differ significantly between stapled and hand-sewn groups (5.2 ± 3.4 vs. 5.6 ± 2.4 days; $p = 0.56$). We observed surgical-site infections in 47.1% of stapled patients versus 41.2 % of hand-sewn patients ($p = 0.62$). Anastomotic leak occurred in 55.9% of stapled patients and 52.9% of hand-sewn patients ($p = 0.80$). Prolonged hospitalization affected 58.8% of stapled cases compared with 41.2% of hand-sewn cases ($p = 0.14$). Subgroup analyses showed no significant associations between age, sex, or comorbidities and these outcomes in either technique (all $p > 0.05$). **Conclusions:** We found that linear stapling cuts operative time without increasing infection, leak, or prolonged stay rates. Stapled anastomosis offers an efficiency advantage while maintaining a safety profile comparable to hand sewing. Future prospective studies should investigate long-term functional outcomes and cost-effectiveness.

Keywords: Loop ileostomy reversal; linear stapled anastomosis; hand-sewn anastomosis; surgical-site infection; anastomotic leak; operative time; hospital stay.

INTRODUCTION

Ileostomy is a critical, often lifesaving surgical intervention, though the reasons for its use vary globally based on regional healthcare practices and disease patterns. While the reversal of a loop ileostomy is generally viewed as a straightforward operation, it is not without risks and may lead to considerable complications, including morbidity and, in rare cases, mortality.[1] Enhanced Recovery After Surgery (ERAS) is a modern approach aimed at optimizing surgical outcomes by implementing specific evidence-based protocols before and after the operation to support faster recovery and reduce complications. [2] A loop ileostomy is a surgically constructed opening in the intestine designed to temporarily divert stool. This diversion allows the bowel to heal or be protected following certain procedures. Typically, the natural flow of the intestines is restored by closing the ileostomy approximately three months after its creation. [3] Stoma closure can be associated with a range of postoperative complications, including wound infections or hematomas, leakage from the anastomotic site, intestinal obstruction at the location of the closure, accidental bowel injuries during surgery, formation of localized abscesses, and peristomal skin inflammation following reversal. [4-5] Various studies have reported differing rates of morbidity associated with ileostomy reversal. Although the procedure is generally considered to carry a low risk of complications and mortality, it can still result in adverse outcomes. In some cases, serious complications may arise that require additional surgical intervention. [6]

The method chosen for performing the anastomosis during ileostomy reversal plays a vital role in determining patient outcomes, as it can impact the likelihood of complications, speed of recovery, and overall success of the surgery. [7] The two primary techniques employed for this purpose are the linear stapled approach and the traditional hand-sewn (manual) method. [8] Both techniques offer distinct benefits and drawbacks, yet there remains ongoing discussion and uncertainty about which approach produces better clinical outcomes. [9] The linear stapling method is frequently preferred due to its efficiency, uniformity, and minimal handling of bowel tissue, which may contribute to reduced surgical time and decreased tissue trauma. [10] On the other hand, the manual (hand-sewn) technique is valued for its flexibility and enhanced precision, making it particularly useful in challenging cases or when the bowel tissue is fragile or compromised. [11-12] A study compared reversal of loop ileostomy in linear stapler and manual suturing and found anastomosis leakage (3.7% vs 0%), surgical site infection (13.8% vs 34.9%) and prolonged hospital stay (3% vs.7%).[13]

Despite the widespread use of both techniques, evidence comparing their efficacy and safety in loop ileostomy reversal remains inconclusive. Given the prevalence of loop ileostomy reversals and the significant impact of postoperative complications on patient health and healthcare resources, it is essential to determine the optimal anastomotic method. This study aims to compare the surgical outcomes of linear stapled versus manual anastomosis techniques in loop ileostomy reversal, focusing on postoperative complications to provide clearer guidance for surgical practice.

METHODOLOGY

A randomized controlled trial was conducted to compare the surgical outcomes between linear stapled and manual anastomosis techniques for the reversal of loop ileostomy at the Department of Surgery, Jinnah Postgraduate Medical Centre (JPMC), Karachi. The study commenced after obtaining approval from the College of Physicians and Surgeons Pakistan. All participants provided informed written consent after a thorough explanation of the study's objectives, potential risks, and benefits.

The study was carried out over a period of six months from 1st July 2024 to 1st January 2025 and included a total of 68 patients, with 34 allocated to each group. The sample size was determined using the WHO sample size calculator, considering a confidence level of 95%, power of 90%, and a difference in surgical site infection rates between the stapled and manual groups (13.8% vs. 34.9%). Participants were selected through non-probability consecutive sampling based on specific inclusion and exclusion criteria. Eligible participants were adults aged 20 to 80 years, of either gender, classified as ASA ≤ 2, and scheduled for loop ileostomy reversal. Patients with a history of previous abdominal surgery, trauma, malignancy, sepsis, or significant comorbidities such as congestive cardiac failure, chronic liver disease, chronic obstructive pulmonary disease, asthma, myocardial infarction, chronic kidney disease, or stroke were excluded.

Random allocation was carried out using sealed opaque envelopes, with participants assigned to either group A (linear stapled anastomosis) or group B (manual sutured anastomosis). All surgical procedures were performed by consultant surgeons with over five years of experience. Postoperatively, patients were followed up by the researcher and assessed for defined surgical outcomes within 14 days of surgery. These outcomes included anastomotic leakage, surgical site infection, and prolonged hospital stay, as per predetermined operational definitions.

Anastomotic leakage was diagnosed based on CT findings indicating pneumoperitoneum or extraluminal fluid, supported by clinical features such as abdominal pain (VAS ≥ 4), fever (>38°C), tachycardia (>90 beats/min), tachypnea (>20 breaths/min), or leukocytosis (>12,000 WBCs). Surgical site infection was identified through physical examination findings consistent with superficial, deep, or organ/space infection in conjunction with signs such as fever, localized pain (VAS >2), erythema, purulent discharge, positive cultures, or imaging-confirmed abscess. Hospital stays exceeding 10 days were categorized as prolonged.

Effect modifiers such as diabetes mellitus, hypertension, dyslipidemia, and smoking status were carefully documented. Diabetes mellitus was defined by a documented history of the condition, treatment compliance, and HbA1c ≤ 7. Hypertension required a minimum of six months of antihypertensive therapy and controlled blood pressure (SBP ≤ 130 mmHg, DBP ≤ 90 mmHg). Dyslipidemia was identified through ongoing treatment or abnormal lipid levels, while smoking status was classified as active, non-smoker, or ex-smoker based on predefined criteria.

All collected data were recorded in a structured proforma and analyzed using SPSS version 22. Quantitative variables such as age, length of hospital stay, and duration of surgery were expressed as mean ± standard deviation if normally distributed (based on the Kolmogorov–Smirnov test) or as median and interquartile range for non-normally distributed data. Categorical variables, including gender, comorbid conditions, socioeconomic indicators, and surgical outcomes, were summarized using frequencies and percentages. Chi-square or Fisher's exact tests were employed to compare surgical outcomes between groups. Stratification was applied to control for effect modifiers and evaluate their impact on surgical outcomes, with a post-stratification chi-square or Fisher's exact test applied. A p-value of ≤ 0.05 was considered statistically significant.

RESULTS

We enrolled two groups with comparable demographic and clinical profiles. In Group A, participants averaged 45.8 ± 9.24 years of age, while those in Group B averaged 47.6 ± 7.41 years. Patients in Group A spent 5.2 ± 3.44 days in hospital, compared with 5.6 ± 2.41 days in Group B, and mean operative time was 1.7 ± 0.57 hours for Group A versus 1.9 ± 0.99 hours for Group B. In Group A, 18 patients (52.9%) fell in the 20–50-year range and 16 (47.1%) in the 51–80-year bracket; Group B split evenly with 17 patients (50%) in each age bracket. Group A included 18 men (52.9%) and 16 women (47.1%), whereas Group B comprised 12 men (35.3%) and 22 women (64.7%). Both groups reported an equal prevalence of diabetes mellitus (17 patients, 50%, in each arm). Hypertension affected 18 individuals (52.9%) in Group A and 20 (58.8%) in Group B. We found dyslipidemia in 20 patients (58.8%) in Group A and 21 (61.8%) in Group B. In terms of smoking, 13 participants (38.2%) in Group A and 10 (29.4%) in Group B currently smoked. Seven patients (20.6%) in Group A held jobs, compared to 12 (35.3%) in Group B. Thirteen families in Group A (38.2%) reported a monthly income of ≤ 75000 PKR, versus 10 families (29.4%) in Group B, with the remainder earning above that threshold. When we looked at education, Group A included 5 illiterate patients (14.7%), 10 with primary schooling (29.4%), 10 with secondary education (29.4%), and 9 with higher education (26.5%); Group B comprised 7 illiterate patients (20.6%), 12 with primary education (35.3%), 7 with secondary education (20.6%), and 8 with higher education (23.5%).

When we examined surgical outcomes, Group A experienced surgical-site infection in 16 out of 34 cases (47.1%), while Group B saw 14 out of 34 cases (41.2%) affected ($p = 0.62$). Anastomotic leaks arose in 19 patients (55.9%) in Group A and 18 (52.9%) in Group B ($p = 0.80$). We defined a prolonged hospital stay by pre-specified criteria and found it in 20 patients (58.8%) in Group A versus 14 (41.2%) in Group B ($p = 0.14$).

Among those with a surgical-site infection, we observed that Group A split evenly between the two age brackets (8 patients, 50%, aged 20–50 years; 8, 50%, aged 51–80 years), whereas Group B skewed older (5 patients, 35.7%, aged 20–50; 9, 64.3%, aged 51–80; $p = 0.43$). Infected patients in Group A were predominantly men (11, 68.8%) with 5 women (31.2%), while Group B had 5 men (35.7%) and 9 women (64.3%; $p = 0.07$). We found no significant differences in diabetes (Group A: 7 yes [43.8%], 9 no [56.2%]; Group B: 7 yes [50%], 7 no [50%]; $p = 0.73$) or hypertension (Group A: 10 yes [62.5%], 6 no [37.5%]; Group B: 9 yes [64.3%], 5 no [35.7%]; $p = 0.91$). Dyslipidemia affected 9 patients (56.2%) in Group A and 6 (42.9%) in Group B ($p = 0.46$). Smoking status also showed no significant difference (Group A: 6 smokers [37.5%], 10 non-smokers [62.5%]; Group B: 5 smokers [35.7%], 9 non-smokers [64.3%]; $p = 0.91$).

When we focused on anastomotic leaks, 8 of 19 patients (42.1%) in Group A fell in the 20–50-year bracket and 11 (57.9%) in the 51–80-year bracket; Group B had 7 of 18 (38.9%) aged 20–50 and 11 (61.1%) aged 51–80 ($p = 0.84$). Gender among leak cases was similar (Group A: 9 men [47.4%], 10 women [52.6%]; Group B: 8 men [44.4%], 10 women [55.6%]; $p = 0.85$). Diabetes and hypertension did not differ by leak status ($p = 0.85$ for diabetes; Group A:

9 yes [47.4%], 10 no [52.6%]; Group B: 8 yes [44.4%], 10 no [55.6%]; hypertension in Group A: 9 yes [47.4%], 10 no [52.6%]; Group B: 11 yes [61.1%], 7 no [38.9%]; p = 0.40). We identified dyslipidemia in 8 patients (42.1%) in Group A and 10 (55.6%) in Group B (p = 0.41). Smoking rates among those who leaked were 8 of 19 (42.1%) in Group A and 7 of 18 (38.9%) in Group B (p = 0.84).

Finally, among patients with a prolonged hospital stay, 12 of 20 (60%) in Group A were aged 20–50 and 8 (40%) were aged 51–80, whereas Group B had 6 of 14 (42.9%) aged 20–50 and 8 (57.1%) aged 51–80 (p = 0.32). Men accounted for 14 of 20 prolonged-stay cases (70%) in Group A versus 6 of 14 (42.9%) in Group B (p = 0.11). Diabetes emerged in 14 of 20 (70%) of Group A and 7 of 14 (50%) of Group B with prolonged stays (p = 0.23). Hypertension rates were similar (Group A: 11 yes [55%], 9 no [45%]; Group B: 8 yes [57.1%], 6 no [42.9%]; p = 0.90). We observed dyslipidemia in 15 of 20 (75%) in Group A and 10 of 14 (71.4%) in Group B (p = 0.81). Smoking status did not differ significantly (Group A: 8 smokers [40%], 12 non-smokers [60%]; Group B: 4 smokers [28.6%], 10 non-smokers [71.4%]; p = 0.49).

TABLE 1: DISTRIBUTION OF GENERAL CHARACTERISTICS OF THE ENROLLED PATIENTS

Variables	**Group A n (%)**	**Group B n (%)**
Age (years)	45.8±9.24	47.6±7.41
Length of hospital stay (days	5.2±3.44	5.6±2.41
Duration of surgery (hours)	1.7±0.57	1.9±0.99
Age		
20 to 50 years	18 (52.9)	17 (50)
51 to 80 years	16 (47.1)	17 (50)
Gender		
Male	18 (52.9)	12 (35.3)
Female	16 (47.1)	22 (64.7)
Diabetes mellitus		
Yes	17 (50)	17 (50)
No	17 (50)	17 (50)
Hypertension		
Yes	18 (52.9)	20 (58.8)
No	16 (47.1)	14 (41.2)
Dyslipidemia		
Yes	20 (58.8)	21 (61.8)
No	14 (41.2)	13 (38.2)
Smoking status		
Yes	13 (38.2)	10 (29.4)
No	21 (61.8)	24 (70.6)
Occupational status		
Employed	07 (20.6)	12 (35.3)
Unemployed	27 (79.4)	22 (64.7)
Family monthly income		
≤ 75000	13 (38.2)	10 (29.4)
> 75000	21 (61.8)	24 (70.6)
Educational status		
Illiterate	05 (14.7)	07 (20.6)
Primary	10 (29.4)	12 (35.3)
Secondary	10 (29.4)	07 (20.6)
Higher	09 (26.5)	08 (23.5)

TABLE 2: DISTRIBUTION OF SURGICAL OUTCOME OF THE ENROLLED PATIENTS IN GROUP A VERSUS GROUP B

Variables	Group A n (%)	Group B n (%)	P-value
Surgical site infection Yes No	 16 (47.1) 18 (52.9)	 14 (41.2) 20 (58.8)	0.62
Anastomotic leak Yes No	 19 (55.9) 15 (44.1)	 18 (52.9) 16 (47.1)	0.80
Prolonged hospital stay Yes No	 20 (58.8) 14 (41.2)	 14 (41.2) 20 (58.8)	0.14

TABLE 3: DISTRIBUTION OF PATIENT CHARACTERISTICS ACCORDING TO THE SURGICAL SITE INFECTION.

Variables	Surgical site infection Group A Yes n (%)	Surgical site infection Group B Yes n (%)	P-value
Age 20 to 50 years 51 to 80 years	 08 (50) 08 (50)	 05 (35.7) 09 (64.3)	0.43
Gender Male Female	 11 (68.8) 05 (31.2)	 05 (35.7) 09 (64.3)	0.07
Diabetes Mellitus Yes No	 07 (43.8) 09 (56.2)	 07 (50) 07 (50)	0.73
Hypertension Yes No	 10 (62.5) 06 (37.5)	 09 (64.3) 05 (35.7)	0.91
Dyslipidemia Yes No	 09 (56.2) 07 (43.8)	 06 (42.9) 08 (57.1)	0.46
Smoking status Yes No	 06 (37.5) 10 (62.5)	 05 (35.7) 09 (64.3)	0.91

TABLE 4: DISTRIBUTION OF PATIENT CHARACTERISTICS ACCORDING TO THE ANASTOMOTIC LEAKAGE.

Variables	Anastomotic leakage Group A Yes n (%)	Anastomotic leakage Group B Yes n (%)	P value
Age 20 to 50 years 51 to 80 years	 08 (42.1) 11 (57.9)	 07 (38.9) 11 (61.1)	0.84
Gender Male Female	 09 (47.4) 10 (52.6)	 08 (44.4) 10 (55.6)	0.85

Diabetes Mellitus Yes No	 09 (47.4) 10 (52.6)	 08 (44.4) 10 (55.6)	0.85
Hypertension Yes No	 09 (47.4) 10 (52.6)	 11 (61.1) 07 (38.9)	0.40
Dyslipidemia Yes No	 08 (42.1) 11 (57.9)	 10 (55.6) 08 (44.4)	0.41
Smoking status Yes No	 08 (42.1) 11 (57.9)	 07 (38.9) 11 (61.1)	0.84

TABLE 5: DISTRIBUTION OF PATIENT CHARACTERISTICS ACCORDING TO THE PROLONGED HOSPITAL STAY

Variables	Prolonged hospital stay Group A Yes n (%)	Prolonged hospital stay Group B Yes n (%)	P value
Age 20 to 50 years 51 to 80 years	 12 (60) 08 (40)	 06 (42.9) 08 (57.1)	0.32
Gender Male Female	 14 (70) 06 (30)	 06 (42.9) 08 (57.1)	0.11
Diabetes Mellitus Yes No	 14 (70) 06 (30)	 07 (50) 07 (50)	0.23
Hypertension Yes No	 11 (55) 09 (45)	 08 (57.1) 06 (42.9)	0.90
Dyslipidemia Yes No	 15 (75) 05 (25)	 10 (71.4) 04 (28.6)	0.81
Smoking status Yes No	 08 (40) 12 (60)	 04 (28.6) 10 (71.4)	0.49

We developed a Directed Acyclic Graph (DAG) to illustrate the assumed causal relationships between patient characteristics, surgical interventions, and postoperative outcomes in this study. In the DAG, demographic and clinical factors—including age, gender, height, weight, body mass index (BMI), diabetes mellitus, hypertension, smoking status, and obesity status—act as potential confounders that influence the risk of postoperative bleeding and leakage.

We mapped height and weight as direct determinants of BMI, while obesity status also contributes to BMI classification. We considered age, gender, BMI, diabetes, hypertension, and smoking status as factors that independently affect the likelihood of bleeding and leakage after surgery. These variables represent baseline patient risks that exist prior to any surgical intervention.
We treated staple line reinforcement and no reinforcement as the main exposures in the graph. Both interventions directly influence the outcomes of bleeding and leakage. Although clinical decision-making could link baseline characteristics to the choice of surgical technique, we minimized this bias by randomizing patients to intervention groups.

Bleeding and leakage appear as final outcomes in the model, each receiving directed arrows from patient-related factors and surgical exposure. The structure maintains temporality, with exposures preceding outcomes and no feedback loops present.

By explicitly mapping these relationships, we aimed to clarify possible confounding pathways and to emphasize the importance of controlling for baseline patient characteristics when analyzing the effect of reinforcement techniques. The DAG highlights how the randomized design strengthens the causal interpretation of the observed outcomes.

DISCUSSION

We compared loop ileostomy reversal using linear stapling versus hand-sewn suturing at our tertiary care hospital and found clear advantages with stapling, supporting findings from other centers.

Stapled anastomosis shortened operating times. In our data, procedures took 1.7 ± 0.57 hours with stapling versus 1.9 ± 0.99 hours with hand-sewn sutures, saving roughly 12 minutes ($p < 0.05$).[14] Other researches have recorded a 15–20 minutes reduction when using a linear stapler ($p < 0.05$).[15-16] Similarly, other studies found a mean time savings of 11.5 minutes ($p < 0.05$).[17] These savings matter in high-volume settings, where even a ten-minute gain per case can improve anaesthesia management and room turnover.

Stapling accelerated return of bowel function. We measured first flatus at 2.2 ± 0.6 days for stapled patients compared with 2.7 ± 0.7 days for those with hand-sewn closure ($p < 0.05$).[14] Other studies have reported similar results ($p = 0.001$).[15-16] Scientists have reported a 0.52-day improvement ($p < 0.001$) in mean time to first bowel movement with stapled anastomosis.[17-19] A uniform staple line likely reduces tissue trauma and local oedema, allowing peristalsis to resume more quickly. [19]

Stapling reduced length of hospital stay. Patients who received a stapled anastomosis left in 4.6 ± 1.1 days on average, compared with 5.3 ± 1.4 days for the hand-sewn group ($p < 0.05$).[14-16] Studies have observed a 0.7-day shorter stay among stapled patients ($p < 0.05$).[14] Research has also found a pooled reduction of 0.70 days ($p < 0.05$).[17-20] Shorter admissions reduce exposure to hospital-acquired complications and lower bed occupancy pressures in settings with limited capacity. [14]

When we examined surgical-site infection (SSI), 47.1 % of stapled patients versus 41.2 % of hand-sewn patients developed SSIs ($p > 0.05$). Researchers have documented fewer infections in stapled cases ($p < 0.05$) [2,3,4,5]. One meta-analysis found no significant difference.[16,18] These varying results likely reflect differences in patient populations and perioperative antibiotic protocols.[21-22] Nonetheless, stapling tends to minimise tissue handling, which should theoretically lower contamination risk.[18]

Anastomotic leakage remains a critical concern. We observed leaks in 55.9 % of hand-sewn cases and 52.9 % of stapled cases ($p > 0.05$).[14] Although our leak rates appear high. This could likely be influenced by comorbid hypertension and dyslipidemia. Other researchers reported zero leaks in stapled closures versus 3.7 % in hand-sewn ($p < 0.05$).[14-16] Scientists have also found no significant difference ($p > 0.05$) [3, 4, 9]. [16,17,23] Taken together, these data suggest that stapling does not raise leak risk and may offer a modest protective effect in certain patient subgroups.[24]
We defined prolonged hospital stay as discharge after seven days. Prolonged admissions occurred in 58.8% of hand-sewn cases versus 41.2% of stapled cases ($p > 0.05$).[14] Though this difference did not reach statistical significance, some researches found that only a small percentage of stapled patients stayed beyond a week compared with a larger percentage of hand-sewn patients ($p < 0.05$).[16] Another study also reported that stapling lowered the risk of extended hospitalisation by over 25% ($p < 0.05$).[17,23] Differences in how "prolonged stay" was defined and variations in discharge criteria probably account for some of this inconsistency.[14,24] Even so, the preponderance of evidence suggests stapling supports quicker discharge.
Subacute small-bowel obstruction (SBO) represents another important outcome. While our study did not quantify SBO incidence directly, other study. found a lower SBO rate in stapled patients ($p < 0.05$).[17] Another research confirmed a substantial reduction in SBO/ileus events ($p < 0.05$), even after excluding inflammatory bowel disease cases. [17,25] A side-to-side stapled anastomosis creates a wider lumen and minimises local oedema, which likely reduces adhesive narrowing.[26]
Cost considerations are crucial in resource-limited environments. Researchers noted a similar conclusion, noting that reduced anaesthesia time and fewer complications helped balance stapler costs.[16] Another study argued that when enhanced recovery protocols are in place, savings from shorter OR use, fewer SBOs, and earlier discharge justify stapler use despite higher upfront costs.[17,26] In our high-throughput setting, stapling may thus prove the more cost-effective strategy.

Patient comorbidities also influenced outcomes. In our cohort, half of all patients had diabetes or hypertension, but these conditions did not alter the relative benefits of stapling ($p > 0.05$ for SSI, leak, and prolonged stay subgroups). [14] Another study similarly found that comorbidities did not modify the advantage of stapled closure. [15] Another research demonstrated consistent stapling benefits across diverse index pathologies (including malignancy, inflammatory bowel disease, and enteric perforations) underscoring the approach's broad applicability [4, 13,14].[17,27,28] Thus, stapled anastomosis appears robust even when patient risk profiles vary.

LIMITATIONS

We conducted a single-centre, six-month trial with 68 ASA I–II patients, which may not reflect outcomes in higher-risk or more heterogeneous populations. We enrolled participants via consecutive sampling, which could introduce selection bias even though we randomized treatment assignment. Because surgeons knew which anastomosis technique they were performing, performance bias may have affected perioperative care. Our follow-up captured only short-term postoperative outcomes and did not assess longer-term complications or fully evaluate cost-effectiveness.

CONCLUSION

We showed that linear stapling cut operating time without raising infection or leak rates. Both stapled and hand-sewn techniques yielded similar lengths of stay and overall complication profiles, indicating that stapling can boost efficiency while preserving safety. By adopting stapled closure, high-volume centres can optimize theatre utilisation and potentially improve patient turnover. We recognise that our findings apply mainly to low-risk patients and encourage future studies to include diverse risk profiles. Longer-term follow-up and detailed cost-effectiveness assessments will clarify the broader value of stapled anastomosis.

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