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ARAŞTIRMA MAKALESİ **RESEARCH ARTICLE**

Clinical Outcomes of Purse-String Versus Linear Skin Closure After Stoma Reversal: A Retrospective Comparative Study

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Abstract

Aim: This study aimed to compare the clinical outcomes of purse-string (PS) and linear skin closure (LS) techniques following stoma reversal.

Materials and Methods: Patients who underwent stoma reversal between January 2020 and January 2025 were retrospectively review ed. Patients were divided into PS and LS groups according to the skin closure technique used. Demographic characteristics, clinical variables, operative findings, and postoperative outcomes were compared between the groups.

Results: A total of 209 patients were included, of whom 68 (32.5%) underwent PS closure and 141 (67.5%) underwent LS closure. The groups were comparable regarding age, sex, body mass index, Charlson Comorbidity Index, and comorbidity profile. ASA score distribution differed significantly between the groups (p=0.039). The distribution of colostomy locations was significantly higher in the LS group (p=0.026). Midline incision use (29.8% vs. 7.4%, p<0.001), drain placement (61.0% vs. 35.3%, p<0.001), and operative time (115.1±65.7 vs. 88.8±44.2 minutes, p=0.003) were significantly greater in the LS group. No significant differences were observed in wound healing time (p=0.340), length of hospital stay (p=0.815), overall morbidity (31.9% vs. 38.2%, p=0.366), reoperation rate (7.8% vs. 10.3%, p=0.547), or mortality (2.1% vs. 1.5%, p=1.000).

Conclusion: PS and LS skin closure techniques provide comparable clinical outcomes following stoma reversal. Although operative time, midline incision use, and drain placement were higher in the LS group, postoperative outcomes did not differ significantly between the two techniques.

Keywords: *Stoma reversal, Ileostomy, Colostomy, Purse-string closure, Linear skin closure, Surgical wound infection*

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Stoma Kapatılması Sonrası Kese Ağzı (Purse-String) ile Doğrusal Cilt Kapatmanın Klinik Sonuçları: Retrospektif Karşılaştırmalı Bir Çalışma

Özet

Amaç: Bu çalışma, stoma kapatılması sonrasında uygulanan kese ağzı (purse-string, PS) ve doğrusal cilt kapatma (linear skin closure, LS) tekniklerinin klinik sonuçlarını karşılaştırmayı amaçlamıştır.

Gereç ve Yöntem: Ocak 2020 ile Ocak 2025 tarihleri arasında stoma kapatılması uygulanan hastalar retrospektif olarak incelendi. Hastalar, kullanılan cilt kapatma tekniğine göre PS ve LS gruplarına ayrıldı. Demografik özellikler, klinik değişkenler, ameliyat bulguları ve postoperatif sonuçlar gruplar arasında karşılaştırıldı.

Bulgular: Toplam 209 hasta çalışmaya dahil edildi; bunların 68'ine (%32,5) PS kapatma, 141'ine (%67,5) ise LS kapatma uygulandı. Gruplar yaş, cinsiyet, vücut kitle indeksi, Charlson Komorbidite İndeksi ve komorbidite profili açısından benzerdi. ASA skoru dağılımı gruplar arasında anlamlı farklılık gösterdi (p=0,039). Kolostomi yerleşimlerinin dağılımı LS grubunda anlamlı olarak daha yüksekti (p=0,026). Orta hat insizyonu kullanımı (%29,8'e karşı %7,4; p<0,001), dren yerleştirilmesi (%61,0'a karşı %35,3; p<0,001) ve ameliyat süresi (115,1±65,7'ye karşı 88,8±44,2 dakika; p=0,003) LS grubunda anlamlı olarak daha yüksekti. Yara iyileşme süresi (p=0,340), hastanede kalış süresi (p=0,815), genel morbidite (%31,9'a karşı %38,2; p=0,366), yeniden ameliyat oranı (%7,8'e karşı %10,3; p=0,547) veya mortalite (%2,1'e karşı %1,5; p=1,000) açısından gruplar arasında anlamlı farklılık saptanmadı.

Sonuç: PS ve LS cilt kapatma teknikleri, stoma kapatılması sonrasında benzer klinik sonuçlar sağlamaktadır. LS grubunda ameliyat süresi, orta hat insizyonu kullanımı ve dren yerleştirilmesi daha yüksek olmasına rağmen, postoperatif sonuçlar açısından iki teknik arasında anlamlı bir farklılık bulunmamıştır.

Anahtar Kelimeler: *Stoma kapatılması, İleostomi, Kolostomi, Büzgü dikişi ile kapatma, Lineer cilt kapatılması, Cerrahi yara enfeksiyonu.*

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INTRODUCTION

Temporary stomas are commonly created in colorectal surgery to protect the anastomosis and minimize the clinical consequences of anastomotic leakage (1). Although stoma reversal is generally considered a safe procedure, it remains associated with various postoperative complications, particularly surgical site infection (SSI) (2).

SSI following stoma reversal is one of the most frequently encountered complications, largely due to chronic bacterial contamination of the peristomal skin and subcutaneous tissues (2). Consequently, the impact of different skin closure techniques on postoperative wound-related outcomes has been the subject of considerable investigation.

Linear skin closure has traditionally been the most widely adopted technique; however, purse-string closure has emerged as an alternative approach in recent years. By allowing continuous drainage through a small central opening, purse-string closure is thought to reduce the risk of SSI (3). Current evidence indicates that the advantages of purse-string closure may be confined primarily to infection-related outcomes. Beyond SSI prevention, no clear differences have been established between purse-string and linear closure with respect to recovery and postoperative morbidity, including wound healing time, operative duration, hospital stay, and incisional hernia occurrence (4, 5). In light of these findings, we sought to investigate the clinical outcomes associated with purse-string (PS) and linear skin closure (LS) in patients undergoing stoma reversal.

MATERIALS AND METHODS

Study Design and Patient Selection

Medical records of consecutive patients who underwent stoma reversal at the General Surgery Department of our institution between

January 2020 and January 2025 were retrospectively evaluated. Only adult patients (≥18 years) were considered eligible for inclusion. Cases with missing clinical information and those undergoing simultaneous major abdominal procedures were excluded from the analysis.

Based on the method of skin closure performed at the time of stoma reversal, patients were allocated to either the purse-string closure (PS) or linear skin closure (LS) group. Clinical information was extracted from both institutional electronic databases and archived patient files. Variables of interest included demographic characteristics, body mass index (BMI), American Society of Anesthesiologists (ASA) classification, Charlson Comorbidity Index (CCI), coexisting medical conditions, indication for the index operation, stoma characteristics, neoadjuvant and adjuvant treatment history, preoperative computed tomography (CT) and colonoscopy findings, anal sphincter tone, operative details, wound healing time, duration of hospitalization, need for reoperation, postoperative morbidity, and mortality.

Wound healing time was defined as the interval until complete epithelialization of the wound and the absence of any further need for wound dressing. This information was obtained retrospectively from wound assessment records documented by the operating surgeon during routine outpatient follow-up visits. Complete epithelialization was defined as the first follow-up visit at which the wound surface was fully epithelialized and no further wound dressing was required. Morbidity was defined as the occurrence of any postoperative complication, including surgical site infection (SSI), ileus, anastomotic leakage, hematoma, seroma, fistula, incisional hernia, and other postoperative adverse events.

Surgical Technique

All stoma reversals were performed according to standard surgical principles. The choice of skin closure technique was based on the operating surgeon's preference. No institutional protocol or predefined patient selection criteria were used for choosing the skin closure technique. The decision was made according to the operating surgeon's routine clinical practice and intraoperative judgment.

In the LS group, the stoma was dissected free from the abdominal wall through an elliptical peristomal skin incision. Following restoration of bowel continuity, anastomosis was performed. Intestinal continuity was re-established using a stapled anastomosis in most patients, whereas hand-sewn anastomosis was reserved for selected cases when stapling was not feasible. Fascial closure was performed using absorbable multifilament sutures, and the skin was closed primarily in a linear fashion with nonabsorbable monofilament sutures. Subcutaneous drains were placed selectively when deemed necessary.

In the PS group, a circular skin incision was made around the enterocutaneous junction. Intestinal anastomosis and fascial closure were performed in the same manner as in the LS group. Skin closure was achieved using the purse-string technique, approximating the skin circumferentially while leaving a central opening of approximately 1 cm to facilitate drainage. Absorbable monofilament sutures were used for skin closure. No subcutaneous drains were placed in this group.

Postoperative SSI, wound-related complications, and other postoperative adverse events were assessed using patient records and follow-up data.

Statistical Analysis

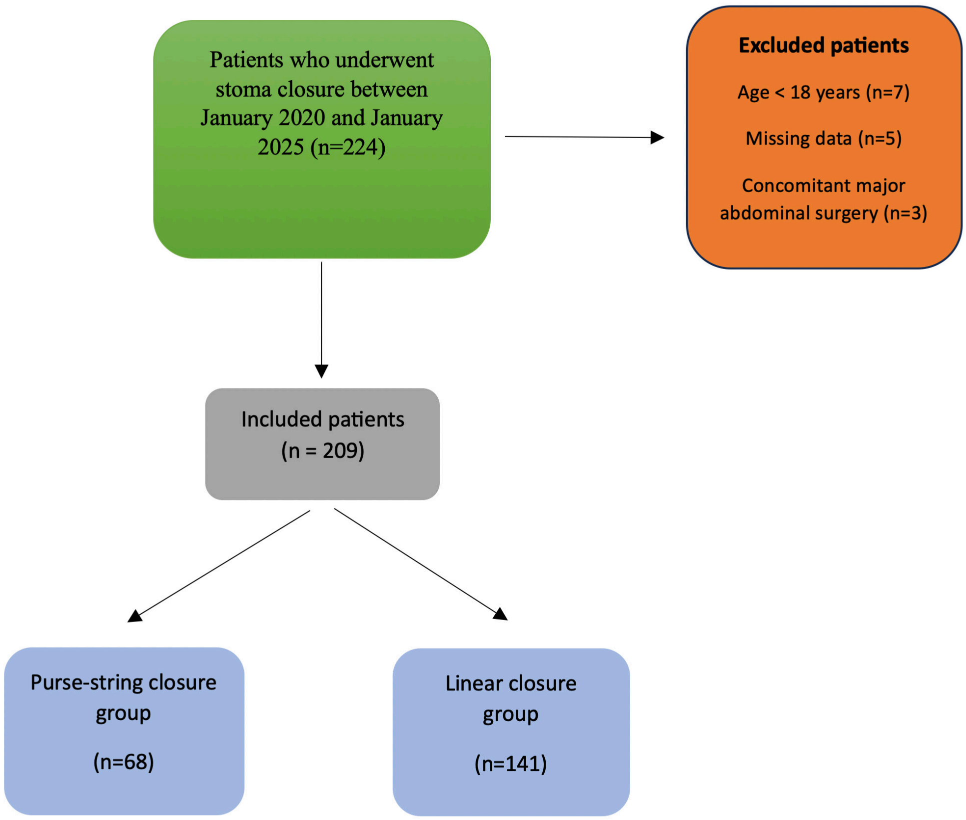
Continuous variables were summarized using means with standard deviations (SDs), medians, and ranges, whereas categorical data were expressed as frequencies and percentages. The normality of data distribution was evaluated using both the Kolmogorov–Smirnov and Shapiro–Wilk tests. Comparisons of continuous variables that did not follow a normal distribution were performed using the Mann–Whitney U test. Differences between categorical variables were assessed using either the chi-square test or Fisher's exact test, depending on the distribution of the data. All statistical analyses were conducted using SPSS Statistics for Windows, version 27.0 (IBM Corp., Armonk, NY, USA). Statistical significance was defined as a two-tailed p-value of less than 0.05.

This study was conducted in accordance with the principles of the Declaration of Helsinki. Approval was obtained from the Local Ethics Committee (Bakırköy Dr. Sadi Konuk Eğitim ve Araştırma Hastanesi Girişimsel Olmayan Bilimsel Araştırmalar Etik Kurulu) prior to the initiation of the study (Date: 09.04.2025; Decision No: 2025-07-10).

RESULTS

A total of 224 patients underwent stoma reversal during the study period from January 2020 to January 2025. After excluding five patients with missing clinical information, seven patients younger than 18 years, and three patients who had simultaneous major abdominal procedures, 209 patients remained eligible for analysis. The process of patient selection and allocation into the study groups is depicted in Figure 1.

Figure 1. Flowchart of patient selection and allocation into the purse-string and linear closure groups.



The study cohort had a mean age of 55.7 ± 14.5 years, ranging from 18 to 84 years. Female patients accounted for 35.9% of the population (n=75), whereas 134 patients (64.1%) were male. The average body mass index (BMI) was 26.4 ± 5.0 kg/m². The majority of patients belonged to the ASA II category (68.4%), and the mean Charlson Comorbidity Index (CCI) was 3.1 ± 2.7. At least one comorbidity was present in 55.0% of patients. The most common comorbid conditions were hypertension (22.5%), diabetes mellitus (19.6%), and cardiovascular disease (12.0%).

The index operation had been performed electively in 57.9% of patients and under emergency conditions in 42.1%. Surgical approaches for the index procedure included open surgery in 49.8%, laparoscopic surgery in 33.5%, and robotic surgery in 16.7% of patients. The underlying pathology was malignant in 57.4% and benign in 42.6% of cases. Loop ileostomy was the most frequently constructed stoma type (57.9%). Most patients had not received neoadjuvant therapy (83.7%) or adjuvant therapy (77.0%). The mean interval between the index operation and stoma reversal was 11.4 ± 8.9 months. Among patients with an ileostomy, the mean distance between the ileostomy and the ileocecal valve was 38.8 ± 21.0 cm. Among patients with a colostomy, the most common locations were the descending colon (14.8%) and sigmoid colon (10.0%). Table 1 provides an overview of the demographic profile, clinical features, characteristics of the index procedure, and stoma-related variables of the study cohort.

Table 1. Baseline demographic, clinical and stoma-related characteristics of the study population (n=209)

		Min-Max	Median	Mean±SD/n-%	
Age (years)		18.0 - 84.0	58.0	55.7 ±	14.5
Sex	Female			75	35.9%
	Male			134	64.1%
BMI		16.4 - 47.3	25.8	26.4 ±	5.0
ASA score	I			7	3.3%
	II			143	68.4%
	III			57	27.3%
	IV			2	1.0%
CCI score		0.0 - 12.0	3.0	3.1 ±	2.7
Comorbidity	None			94	45.0%
	Present			115	55.0%
Comorbid conditions	Hypertension			47	22.5%
	Diabetes mellitus			41	19.6%
	Cardiovascular disease			25	12.0%
	Neurological disease			15	7.2%
	Pulmonary disease			11	5.3%
	Chronic kidney disease			10	4.8%
	Urological disease			7	3.3%
	Malignancy			5	2.4%
	Hematological disease			2	1.0%
	Others			24	11.5%
Index surgery	Emergency			88	42.1%
	Elective			121	57.9%
Initial Surgical Approach	Laparoscopic			70	33.5%
	Open			104	49.8%
	Robotic			35	16.7%
Type of stoma	Loop ileostomy			121	57.9%
	End ileostomy			10	4.8%
	Loop coloctomy			14	6.7%
	End colostomy			41	19.6%
	Ileostomy with mucous fistula			19	9.1%
	Jejunostomy			6	2.9%

Pathological diagnosis at initial surgery	Benign			89	42.6%
	Malignant			120	57.4%
Neoadjuvant therapy	None			175	83.7%
	Chemotherapy			5	2.4%
	Radiotherapy			16	7.7%
	Chemoradiotherapy			13	6.2%
Adjuvant therapy	None			161	77.0%
	Chemotherapy			42	20.1%
	Radiotherapy			1	0.5%
	Chemoradiotherapy			5	2.4%
Distance between ileostomy and ileocecal valve (cm)		10.0 - 100.0	30.0	38.8 ± 21.0	
Colostomy site	None			148	70.8%
	Ascending colon			2	1.0%
	Transverse colon			7	3.3%
	Descending colon			31	14.8%
	Sigmoid colon			21	10.0%
Interval between initial surgery and stoma closure (months)		1.0 - 57.0	9.0	11.4 ± 8.9	

***ASA:** American Society of Anesthesiologists; **CCI**: Charlson Comorbidity Index; **BMI:** Body Mass Index; **SD:** Standard deviation.*

According to the skin closure technique, 68 patients (32.5%) underwent purse-string closure (PS) and 141 patients (67.5%) underwent linear skin closure (LS). No significant differences were observed between the groups regarding age, sex distribution, BMI, CCI, or the presence of comorbidities. However, ASA score distribution differed significantly between the groups ($p=0.039$). No significant differences were found in the prevalence of diabetes mellitus, hypertension, cardiovascular disease, pulmonary disease, neurological disorders, renal disease, or other comorbid conditions (all $p>0.05$). The demographic and clinical characteristics of the two groups are presented in Table 2.

Table 2. Comparison of baseline characteristics between the purse-string and linear closure groups

		Purse-string group (n=68)		Linear group (n=141)			
		Mean±SD/n-%	Median	Mean±SD/n-%	Median		
Age (years)		54.1 ± 15.4	56.5	56.5 ± 14.1	59.0	0.296	m
Sex	Female	27 39.7%		48 34.0%		0.424	X²
	Male	41 60.3%		93 66.0%			
ASA score	ASA I	2 2.9%		5 3.5%		0.039	X²
	ASA II	49 72.1%		94 66.7%			
	ASA III	16 23.5%		42 29.8%			
	ASA IV	1 1.5%		1 0.7%			
BMI		26.5 ± 5.2	25.6	26.3 ± 4.9	26.1	0.971	m
CCI score		3.0 ± 2.5	3.0	3.2 ± 2.7	3.0	0.893	m

Comorbidity	None	29	42.6%	65	46.1%	0.638	X²
	Present	39	57.4%	76	53.9%		
Diabetes mellitus		16	23.5%	25	17.7%	0.323	X²
Hypertension		17	25.0%	30	21.3%	0.546	X²
Cardiovascular disease		12	17.6%	13	9.2%	0.079	X²
Pulmonary disease		3	4.4%	8	5.7%	0.702	X²
Neurological disease		6	8.8%	9	6.4%	0.522	X²
Urological disease		3	4.4%	4	2.8%	0.553	X²
Malignancy		2	2.9%	3	2.1%	0.661	X²
Chronic kidney disease		4	5.9%	6	4.3%	0.606	X²
Hematological disease		1	1.5%	1	0.7%	0.546	X²
Other		7	10.3%	17	12.1%	0.708	X²

m Mann-Whitney U test / X² Chi-square test (Fischer's exact test)
***ASA:** American Society of Anesthesiologists; **CCI**: Charlson Comorbidity Index; **BMI:** Body Mass Index;*
***SD:** Standard deviation.*

Preoperative characteristics were comparable between the groups with respect to the urgency of the index operation, surgical approach, underlying pathology, receipt of neoadjuvant or adjuvant therapy, and the interval between the index operation and stoma reversal (all p>0.05). Among patients with ileostomies, the distance between the stoma and the ileocecal valve was similar between groups (p=0.745). The distribution of colostomy locations differed significantly between the groups (p=0.026). No significant differences were observed regarding the rates and findings of preoperative colonoscopy, CT findings, or anal sphincter tone (all p>0.05). A comparison of preoperative and stoma-related characteristics is presented in Table 3.

Table 3. Comparison of preoperative and stoma-related characteristics between the purse-string and linear closure groups

		Purse-string group (n=68)			Linear group (n=141)				
		Mean±SD/n-%		Median	Mean±SD/n-%		Median		
Index surgery	Emergency	23	33.8%		65	46.1%		0.092	X²
	Elective	45	66.2%		76	53.9%			
Initial Surgical Approach	Laparoscopic	27	39.7%		43	30.5%		0.414	X²
	Open	31	45.6%		73	51.8%			
	Robotic	10	14.7%		25	17.7%			
Pathological diagnosis at index surgery	Benign	30	44.1%		59	41.8%		0.755	X²
	Malignant	38	55.9%		82	58.2%			
Neoadjuvant therapy	None	55	80.9%		120	85.1%		0.438	X²
	Chemotherapy	1	1.5%		4	2.8%			
	Radiotherapy	7	10.3%		9	6.4%			
	Chemoradiotherapy	5	7.4%		8	5.7%			

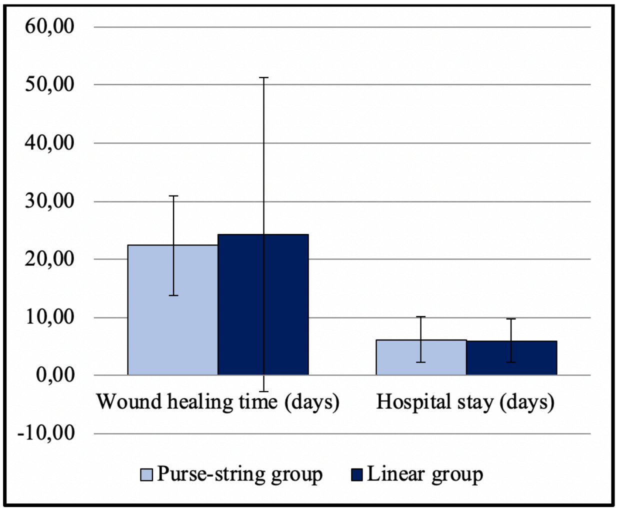
Adjuvant therapy	None	56		82.4%		105		74.5%			0.204	X²
	Chemotherapy	10		14.7%		32		22.7%				
	Radiotherapy	0		0.0%		1		0.7%				
	Chemoradiotherapy	2		2.9%		3		2.1%				
Interval between index surgery and stoma closure (months)		11.2	±	9.3	9.0	11.4	±	8.7	10.0		0.670	m
Distance between ileostomy and ileocecal valve (cm)		39.0	±	22.6	30.0	38.7	±	20.1	30.0		0.745	m
Colostomy site	None	55		80.9%		93		66.0%			0.026	X²
	Ascending colon	0		0.0%		2		1.4%				
	Transverse colon	3		4.4%		4		2.8%				
	Descending colon	6		8.8%		25		17.7%				
	Sigmoid colon	4		5.9%		17		12.1%				
Preoperative colonoscopy	No	7		10.3%		12		8.5%			0.674	X²
	Yes	61		89.7%		129		91.5%				
Colonoscopy findings	Normal	26		42.6%		59		45.7%			0.591	X²
	Abnomal	35		57.4%		70		54.3%				
Preoperative CT	No	5		7.4%		8		5.7%			0.638	X²
	Yes	63		92.6%		133		94.3%				
CT findings	Normal	48		76.2%		100		75.2%			0.960	X²
	Abnomal	15		23.8%		33		24.8%				
Preoperative anal sphincter tone	Normal	67		98.5%		136		96.5%			0.666	X²
	Decreased	1		1.5%		5		3.5%				

m Mann-Whitney U test / X² Chi-Square test (Fisher' exact test)

***CT:** Computed Tomography; **SD:** Standard deviation*

With respect to operative variables, no significant difference was observed in the anastomotic technique, and stapled anastomosis was used in the vast majority of patients. With regard to operative characteristics, patients in the LS group underwent midline incision more often than those in the PS group (29.8% vs. 7.4%, $p<0.001$). Likewise, the use of subcutaneous drains was more prevalent among LS patients (61.0% vs. 35.3%, $p<0.001$). The frequency of concomitant hernia repair and the need for postoperative blood transfusion did not differ significantly between the two groups. The mean operative duration was greater in the LS group compared with the PS group (115.1 ± 65.7 vs. 88.8 ± 44.2 minutes, $p=0.003$). Conversely, no between-group differences were observed in wound healing time or length of hospitalization ($p=0.340$ and $p=0.815$, respectively) (Figure 2).

Figure 2. Comparison of wound healing time and length of hospital stay between the purse-string and linear closure groups.



Overall postoperative morbidity affected 38.2% of patients in the PS group and 31.9% of those in the LS group (p=0.366). Similarly, reoperation rates (10.3% vs. 7.8%, p=0.547) and mortality rates (1.5% vs. 2.1%, p=1.000) remained comparable between the groups. A detailed comparison of operative and postoperative outcomes is provided in Table 4.

Table 4. Comparison of operative and postoperative outcomes between the purse string and linear closure groups

		Purse-string group (n=68)		Linear group (n=141)			
		Mean±SD/n-%	Median	Mean±SD/n-%	Median		
Anastomotic technique	Hand-sewn	0 0.0%		2 1.4%		0.324	X^2
	Stapled	68 100.0%		139 98.6%			
Incision type	Stoma-site incision	63 92.6%		99 70.2%		*<0.001*	X^2
	Midline incision	5 7.4%		42 29.8%			
Hernia repair	No	59 86.8%		126 89.4%		0.581	X^2
	Yes	9 13.2%		15 10.6%			
Drain placement	No	44 64.7%		55 39.0%		*<0.001*	X^2
	Yes	24 35.3%		86 61.0%			
Postoperative blood transfusion requirement	No	68 100.0%		139 98.6%		1.000	X^2
	Yes	0 0.0%		2 1.4%			
Operative time (min)		88.8 ± 44.2	80.0	115.1 ± 65.7	99.0	*0.003*	m
Wound healing time (days)		22.4 ± 8.6	20.5	24.3 ± 27.0	19.0	0.340	m
Length of hospital stay (days)		6.2 ± 3.9	5.0	6.0 ± 3.7	5.0	0.815	m

Reoperation	No	61	89.7%	130	92,2%	0.547	X²
	Yes	7	10.3%	11	7,8%		
Morbidity	No	42	61.8%	96	68,1%	0.366	X²
	Yes	26	38.2%	45	31,9%		
Mortality	No	67	98.5%	138	97,9%	1,000	X²
	Yes	1	1.5%	3	2,1%		

m Mann-Whitney U test / X² Chi-Square test (Fisher's exact test)

***SD:** Standard deviation*

Analysis of postoperative complications revealed that SSI, ileus, and incisional hernia were the most frequently encountered adverse events. SSI occurred in 13.2% of patients in the PS group and 7.8% in the LS group, whereas ileus was observed in 13.2% and 6.4% of patients, respectively. Incisional hernia developed in 8.8% of patients in the PS group and 9.2% of those in the LS group. Hematoma, seroma, fistula, anastomotic leakage, subcutaneous abscess, evisceration, and perforation were uncommon in both groups. The overall distribution of complications was comparable between the groups. As some patients experienced more than one complication, the total number of complications exceeded the number of patients with postoperative morbidity. Detailed postoperative complication profiles are presented in Table 5.

Table 5. Comparison of postoperative complications between the purse-string and linear closure groups

Postoperative complications	Purse-string group (n=68)		Linear group (n=141)	
	n	%	n	%
Surgical site infection	9	13.2%	11	7.8%
Hematoma	1	1.5%	6	4.3%
Seroma	0	0.0%	4	2.8%
Fistula	0	0.0%	2	1.4%
Ileus	9	13.2%	9	6.4%
Anastomotic leakage	3	4.4%	3	2.1%
Incisional hernia	6	8.8%	13	9.2%
Subcutaneous abscess	0	0.0%	1	0.7%
Evisceration	1	1.5%	3	2.1%
Perforation	1	1.5%	0	0.0%

Some patients experienced more than one postoperative complication; therefore, the sum of complications may exceed the total number of patients with morbidity.

DISCUSSION

The present study compared the clinical outcomes of purse-string (PS) and linear skin closure (LS) techniques following stoma reversal. The principal finding was the absence of significant differences between the two techniques with respect to wound healing time, reoperation, overall morbidity, and mortality. In contrast, midline incision use, drain placement, and operative time were significantly higher in the LS group. These findings suggest that postoperative outcomes following stoma reversal are influenced not only by the skin closure technique itself but also by patient characteristics, stoma-related factors, and the overall complexity of the procedure.

Although stoma reversal is generally considered a relatively minor surgical procedure, it may still be associated with clinically relevant complications, including surgical site infection (SSI), ileus, anastomotic leakage, incisional hernia, and the need for reoperation (6, 7). The prolonged exposure of the peristomal skin and subcutaneous tissues to fecal contamination contributes substantially to wound-related complications (8). Consequently, the optimal method of skin closure after stoma reversal has become one of the most extensively investigated technical aspects of the procedure.

The purse-string closure technique was first described by Banerjee and was designed to reduce the risk of SSI by permitting continuous drainage through a small central opening in the wound (3). By avoiding complete skin closure, this technique may limit the accumulation of fluid and bacterial contamination within the subcutaneous space (1, 6). A substantial body of evidence supports the potential benefit of PS closure in reducing SSI rates. In a meta-analysis of randomized controlled trials, Hsieh et al. demonstrated significantly lower infection rates with PS closure compared with conventional linear closure (4). Similar findings were reported by Rondelli et al., who observed a significant reduction in wound infections associated with the PS technique (9). More recent systematic reviews and meta-analyses, including a Cochrane review and contemporary analyses published in 2024–2025, have largely confirmed these findings (10, 11).

Despite these observations, no significant difference in overall morbidity was identified between the two groups in the present study. Although this may initially appear inconsistent with reports demonstrating lower SSI rates after PS closure, overall morbidity encompasses a broad spectrum of postoperative events, including ileus, anastomotic leakage, incisional hernia, hematoma, seroma, and other complications. Indeed, several meta-analyses have reported that while PS closure may reduce SSI rates, it has not consistently translated into lower overall morbidity, reduced reoperation rates, or shorter hospital stays (4–11). Therefore, the beneficial effect of PS closure on SSI may not necessarily be reflected in analyses of overall postoperative morbidity.

One noteworthy finding of the current study was the higher proportion of colostomies in the LS group. Compared with ileostomy reversal, colostomy closure may involve a greater bacterial burden, increased fecal contamination, and more extensive tissue dissection. Liang et al. identified colostomy as an independent risk factor for SSI following stoma reversal (6). Likewise, recent meta-analytic evidence has suggested that colostomy closure may be associated with a higher risk of wound-related complications (12). Nevertheless, despite a greater proportion of colostomies in the LS group, no significant differences in morbidity or mortality were observed. This finding highlights the difficulty of evaluating the isolated impact of skin closure techniques independent of patient selection and stoma-related characteristics.

Another important observation was the significantly higher rate of midline incision use in the LS group. These baseline differences indicate that complete homogeneity between the study groups could not be achieved. Colostomy closure, the need for a midline incision, and drain placement may all reflect greater operative complexity. Therefore, the longer operative time observed in the LS group should not be attributed solely to the skin closure technique. Our findings suggest that operative duration and postoperative outcomes may also be influenced by patient- and procedure-related factors. Midline access is often required in patients with dense adhesions, colostomies, concomitant pathology, or technically demanding operative conditions. Such cases frequently necessitate more extensive dissection, potentially resulting in longer operative times and a greater need for drain placement. The higher rates of both midline incision and drain use observed in the LS group suggest that these patients may have represented a more surgically complex population. This may also explain the longer operative times recorded in the LS group, as skin closure itself constitutes only a small component of the overall procedure. Previous meta-analyses have generally reported no significant differences in operative duration between PS and LS techniques (5,9,10). Although operative time was longer in the LS group in our cohort, this difference is more likely attributable to procedural complexity than to the skin closure technique itself.

No significant difference was observed in wound healing time between the two groups. While the open central defect inherent to the PS technique might theoretically prolong secondary wound healing, wound infections and fluid collections following LS closure may similarly delay recovery. Consequently, each technique possesses distinct advantages and disadvantages that may ultimately balance one another. Although some studies have reported longer wound healing times after PS closure, long-term clinical outcomes have generally remained comparable between the two approaches (5, 13). The absence of a significant difference in wound healing time in the present study supports the notion that the biological advantages of each technique may result in similar overall clinical outcomes.

Reoperation rates were also comparable between groups. Reoperation is typically required for major complications such as anastomotic leakage, severe ileus, evisceration, or significant wound-related problems. Previous studies have not demonstrated a consistent effect of skin closure technique on reoperation rates (9, 14). Accordingly, the comparable reoperation rates observed in our study suggest that both techniques provide an acceptable safety profile. Analysis of individual complications revealed SSI, ileus, and incisional hernia to be the most common adverse events, a finding consistent with previous reports (6, 12, 15). Although SSI appeared numerically more frequent in the PS group, the number of events was insufficient to permit meaningful subgroup analysis. Furthermore, several patients experienced more than one complication, complicating interpretation of complication-specific outcomes. Therefore, these findings should be interpreted with caution.

Incisional hernia rates were similar between the two groups. Previous meta-analyses have likewise reported no significant difference in incisional hernia development between PS and LS closure techniques (8,10,14). Factors such as fascial closure technique, wound infection, obesity, and duration of follow-up are likely to play a more important role in incisional hernia formation than the method of skin closure itself (6).

Several limitations of this study should be acknowledged. First, the retrospective single-center design may limit the generalizability of the findings. Second, the lack of randomization introduces the potential for selection bias. Third, cosmetic outcomes, patient satisfaction, and quality-of-life measures were not assessed. Finally, significant differences in ASA score distribution, colostomy rate and location, midline incision, and drain placement indicate that complete baseline homogeneity between the study groups could not be achieved. These baseline imbalances may have acted as potential confounding factors, particularly with respect to operative time and postoperative outcomes. In addition, several postoperative complications occurred infrequently; therefore, separate statistical comparisons for individual complications were not performed. Consequently, complication-specific findings should be interpreted with caution. Nevertheless, the inclusion of a contemporary five-year patient cohort and the comprehensive evaluation of both operative and postoperative outcomes represent important strengths of the present study.

CONCLUSION

No significant differences were observed between purse-string and linear skin closure techniques with respect to wound healing time, length of hospital stay, reoperation, overall morbidity, or mortality following stoma reversal. Although midline incision use, drain placement, and operative time were more frequent in the LS group, these differences did not translate into inferior postoperative outcomes. The present findings suggest that both techniques are safe and feasible options for skin closure after stoma reversal. However, postoperative outcomes appear to be influenced not only by the skin closure technique but also by patient characteristics, stoma type, and operative complexity. Therefore, these factors should be considered collectively when selecting the most appropriate skin closure method. The choice of closure method should be individualized according to stoma characteristics, procedural complexity, and surgeon preference. Larger prospective randomized studies are warranted to further validate these findings.

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