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End-to-End Anastomosis with Omega Suture Versus End to Anterior Rectal Wall in Colorectal Anastomosis in sigmoid and upper rectal cancer, a prospective competitive study

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ABSTRACT

Background: Anastomotic techniques in colorectal surgery significantly influence postoperative complications, especially anastomotic leakage. This research contrasts two single-stapling methods: end-to-anterior rectal wall anastomosis and omega suture-based end-to-end anastomosis.

Aim: This study aims to compare the postoperative outcomes and complications associated with end-to-end with omega suture versus end to anterior rectal wall colorectal anastomosis in patients undergoing laparoscopic anterior resection in sigmoid and upper rectum cancer.

Patients and Methods: A prospective comparative study was conducted involving 40 patients diagnosed with sigmoid and upper rectal cancer at Ain Shams University hospitals. Participants were divided into two groups: group A (20 patients) underwent laparoscopic anterior resection with end-to-end with omega suture colorectal anastomosis, while group B (20 patients) underwent end to anterior rectal wall colorectal anastomosis.

Results: Group A demonstrated significantly longer anastomotic and total operative times compared to Group B ($P < 0.001$) and significant early postoperative bowel recovery ($p=0.02$). At 3 and 6 months postoperatively, Group A exhibited a statistically significant reduction in the frequency and urgency of defecation relative to Group B ($P = 0.04$) however, this difference was not maintained at 12 months, where no significant difference was observed. All other comparative parameters, including postoperative complications and long-term functional outcomes, were comparable between groups and did not reach statistical significance.

Conclusion: Both single-stapled anastomotic techniques—end-to-end anastomosis with omega suture (Group A) and end-to-anterior rectal wall anastomosis (Group B) are safe and effective with comparable post-operative finding.

KEYWORDS: Anastomosis, bowel, laparoscopic, resection.

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INTRODUCTION

Colorectal cancer is the third most common cancer diagnosed worldwide and the second most common cause of cancer-related mortality. [1]

The fundamental goal of anterior resection, the gold standard surgical technique for both rectal and rectosigmoid tumors, is to maintain oncological safety. Despite the technical difficulties of working within a deep and small pelvis, this is accomplished via secure anastomosis and sufficient resection margins. [2]

One of the most dangerous postoperative consequences after colorectal procedures is anastomotic leaking, which occurs in around 3–20% of patients [3]. It affects short-term results by raising the incidence of reoperations and postponing adjuvant treatment. It also jeopardizes long-term results by raising the risk of local recurrences and lowering overall survival rates. [4]

Optimizing anastomotic structural integrity to reduce postoperative morbidity related to leakage is the core idea that underpins all reconstructive treatments. Thus, the development of a dependable and consistent anastomotic approach and a comprehensive knowledge of the features of each anastomotic method are essential elements in the prevention of anastomotic leakage. [5]

The junction of the linear and circular staple lines in a traditional colorectal anastomosis result in stapled corners known as "dog-ears," which are thought to be a risk factor for anastomotic leaking because of their propensity for ischemia. By removing this junction, the single-stapling approach lowers the danger associated with these susceptible areas, whether it is used as an end-to-side stapled anastomosis or end-to-end with an omega suture. [6]

The clinical results of these two single stapled anastomosis variations in patients having anterior resection for sigmoid and upper rectal tumors are examined in this research.

In terms of post-surgical anastomotic leakage, bowel function, and operational and intraoperative findings, this research compares end-to-end anastomosis with omega suture vs end-to-anterior rectal wall in colorectal anastomosis.

PATIENTS AND METHODS

The research was conducted at Ain Shams University Hospitals' General Surgery Department and included 40 patients diagnosed as having sigmoid and upper rectal cancer for lap anterior resection procedure presenting to Ain Shams University hospitals.

The project had received ethical committee approval, and each participant gave their informed consent.

Type of study: prospective comparative study.

(1) Inclusion criteria: patients above 18 years of age, regardless of sex. Rectosigmoid carcinoma. Proximal rectal carcinoma.

(2) Exclusion criteria: those under 18 years of age. Recurrent or nonresectable cancer, worsened by conditions such as obstruction or perforation. prior left-sided colorectal operations.

Study procedures Assessment of the patient

Clinical assessment: personal history, including age, weight, profession, and any unique or medically significant habits, like smoking. History of present illness: symptoms such as bleeding per rectum, pain, tenesmus, change of bowel habits, piles, and weight loss. Number of cycles of neoadjuvant therapy. History of medical diseases, especially diabetes, drug allergies, previous blood transfusion, and previous operations.

Clinical examination: general examination. The general condition of the patient and the comorbidities. Chest examination. Cardiological examination. Local examination of the abdomen and DRE.

Investigations:

(1) Laboratory: preoperative laboratories.

(2) Radiological: Dynamic MRI for rectal cancer. Chest, abdomen, and pelvis computed tomography scan with contrast for metastasis.

(3) Colonoscopy with histopathology.

Specialized studies were mandated for patients with certain problems, including ECG for those over 40 years of age and echocardiography for those over 60 years of age.

OPERATIVE TECHNIQUE

Trained colon and rectal surgeons conducted standardized laparoscopic anterior resections on all patients. A Veress needle was inserted into the left hypochondrium to create a pneumoperitoneum after the patient had been postioned and sterilized. Trocars were then implanted at a pressure of 12 mmHg. The left colon and sigmoid were fully mobilized up to the splenic flexure by medial to lateral dissection then applying countertraction and lateral to medial dissection in the avascular plane of Toldt till the Treitz's ligament **figure (1,2)**. Both the inferior mesenteric vein and the inferior mesenteric artery were tied up **figure (3,4,5).** Tumor-specific mesorectal excision was done **figure (6**). The rectal wall was dissected circumferentially and the distal limit of resection has been determined **figure (7).** An endo GIA stapler is used to execute the distal margin segment, guaranteeing a minimum clearance of 5 cm underneath the lower border of the tumor. The proximal colon was removed after the safety margin was used to define the proximal transaction point.

Three basic rules were followed in the execution of all rectal anastomoses: (1) sufficient splenic flexure and rectal stump mobilization to achieve a tension-free anastomosis; (2) maintenance of adequate blood perfusion to the descending colon and rectal stump; and (3) careful hemostasis to guarantee minimal bleeding during preparation.

Group A: (end to end with Omega suture)

After the rectum was divided, the staple rod was able to reach the rectal stump next to the linear stapler line by inserting a 31 mm circular stapler via the anus. Both ends of the linear stapler line were included in an omega suture using 2/0 proline (**Figure 8**). As the omega suture was fastened, the linear stapler line was roughly positioned in an omega shape around the circular stapler's rod Using the circular stapler, this method produced a full resection of the linear stapler line.

Group B: (end to anterior rectal wall)

Proline 2/0 was used to apply a burse string suture across the circular stapler's anvil at the descending colon's transection site. Colorectal anastomosis was carried out after the circular stapler was inserted via the anus and its rod was pointed toward the anterior rectal wall.

Pfannenstiel incision was used to remove the specimen. In both stapling techniques, the stapler donuts were always examined for completeness, and the anastomotic integrity was confirmed using an air leak test (trans anal air insufflation with the pelvis filled with saline). A drain was installed in the pelvis.

Follow-up: all patients will be followed up for 12 months postoperative.

Short-term outcomes:

(1) **Intra-operative**:

Duration of surgery, Intra-operative blood loss, and anastomotic leak test.

(**2**) **During hospital stay:** when to be open bowel**,** anastomotic leakage**,** bowel recovery, ileus, postoperative hemorrhage, Wound complication and hospital stay.

Long-term outcomes (3, 6 and 12 months postoperative):

Follow-up of bowel function as frequency of bowel motions. and urgency, which is the sudden urge to empty the bowel.

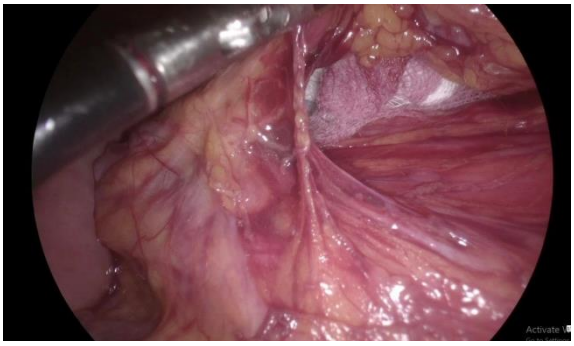

Fig. (1) Medial to lateral dissection

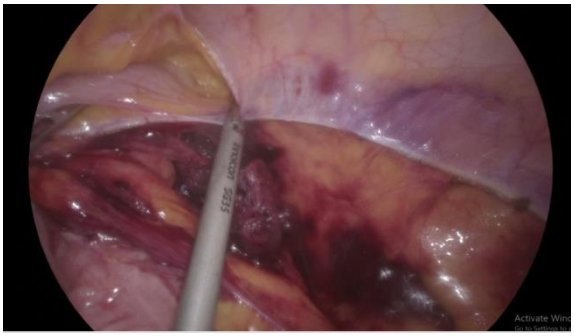

Fig. (2) Lateral to medial dissection

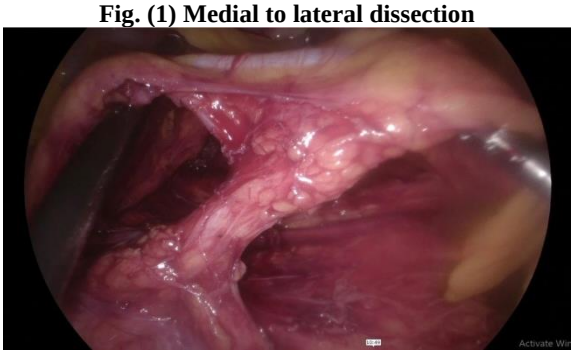

Fig. (3) Dissection of IMA

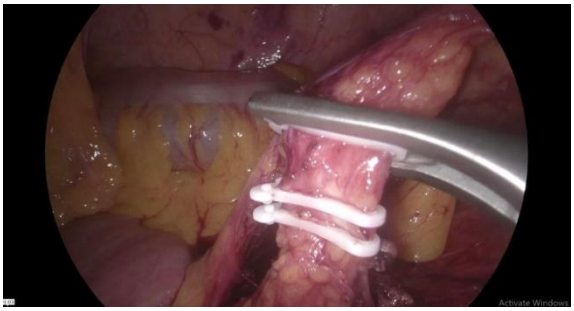

Fig. (4) Clipping IMA

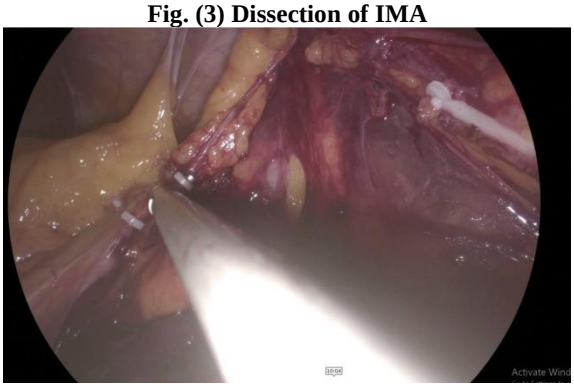

Fig.(5) Clipping IMV

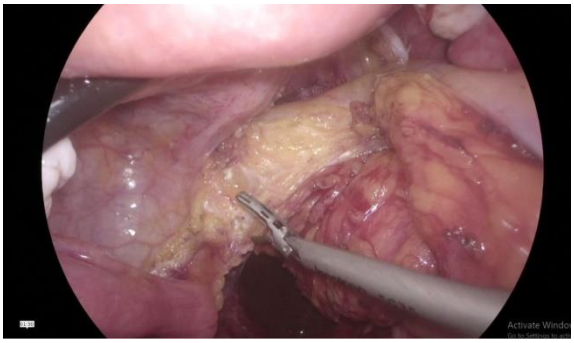

Fig. (6) Tumor specific mesorectal excision

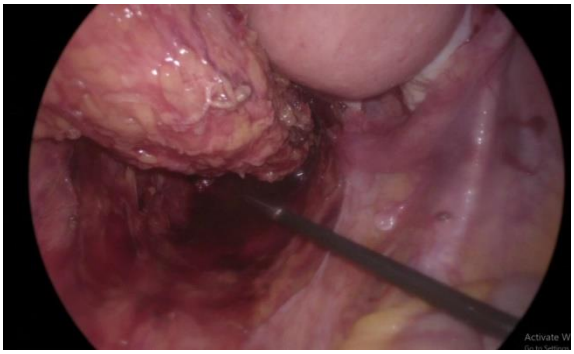

Fig. (7) Complete dissection of rectum laterally and posteriorly

Fig. (8) Omega suture formation

Fig. (9) Complete doughnuts with complete suture line.

Fig. (10) Approximation of anastomotic end with omega suture around the stapler rod.

Statistical methods

IBM SPSS statistics (Statistical Package for Social Sciences) software version 28.0, IBM Corp., Chicago, USA, 2021, was used to code, tabulate, and statistically analyze the gathered data. The Shapiro-Wilk test was used to check for normality in quantitative data, which were then reported as mean±SD (standard deviation) and the range's lowest and maximum, before being compared using an independent t-test. The Chi square test and Fisher's Exact test are used to compare qualitative data that is expressed as numbers and percentages. If the p-value was less than 0.050, the significance level was considered significant; if not, it was considered non-significant.

RESULTS

Table 1: Comparison between group A and group B regarding demographic data and characteristics of the studied patients

Variables		Group-A (Total=20)	Group-B (Total=20)	p-value
Age (years)	**Mean±SD**	46.6±15.7	48.9±12.7	0.614
	Range	20.0–67.0	29.0–66.0	
Gender (n, %)	**Male**	14 (70.0%)	14 (70.0%)	0.999
	Female	6 (30.0%)	6 (30.0%)	
BMI (kg/m^2)	**Mean±SD**	27.4±3.4	26.5±4.6	0.486
	Range	22.7–33.6	20.4–33.2	
Smoking (n, %)		13 (65.0%)	8 (40.0%)	0.113
Hypertension (n, %)		13 (65.0%)	12 (60.0%)	0.744
Diabetes mellitus (n, %)		10 (50.0%)	12 (60.0%)	0.525
Coronary artery disease (n, %)		1 (5.0%)	2 (10.0%)	0.999
ASA (n, %)	**I**	14 (70.0%)	14 (70.0%)	0.999
	II	6 (30.0%)	6 (30.0%)	

Demographic data (age, sex, BMI, smoking, and ASA) and different comorbidities (diabetes mellitus, hypertension, and coronary artery disease) were insignificantly different between both groups

Table 2: Comparison between group A and group B regarding tumor stage and lymph node stage of the studied patients

Variables		Group-A (Total=20)	Group-B (Total=20)	p-value
Tumor stage	**T1**	3 (15.0%)	5 (25.0%)	0.544
	T2	10 (50.0%)	6 (30.0%)	
	T3	7 (35.0%)	9 (45.0%)	
Lymph node stage	**N1**	5 (25.0%)	7 (35.0%)	0.490
	N2	15 (75.0%)	13 (65.0%)	
Metatasis	**M0**	20 (100.0%)	20 (100.0%)	NA
Stage	**III**	20 (100.0%)	20 (100.0%)	NA

Tumor data (tumor size, tumor stage, and lymph node stage) were insignificantly different between both groups

Operative finding between studied groups

Table 3: Comparison between group A and group B regarding intraoperative findings (Distance of the anastomosis from anal verge anastomotic time operative time air leak test and blood transfusion) of the studied patients

Variables		Group-A (Total=20)	Group-B (Total=20)	p-value
Distance of the anastomosis from anal verge (mm)	**Mean±SD**	10.07	9.96	**0.628**
	Range	9-11	9-10.5	
Time of anastomosis (minutes)	**Mean±SD**	22.9±3.4	13.5±4.9	**<0.001***
	Range	20.0–35.0	11.0–30.0	
Time of operation (minutes)	**Mean±SD**	166.2±7.9	151.4±6.9	**<0.001***
	Range	150.0–180.0	140.0–165.0	
Positive leak test (n, %)		1 (5.0%)	2 (10.0%)	0.999
Blood transfusion (n, %)		2 (10.0%)	3 (15.0%)	0.999

Group A had significantly longer anastomotic and operative time compared to group B (P<0.001). Distance of the anastomosis from anal verge, air leak test and intraoperative blood transfusion were insignificantly different between both groups.

Anastomotic time: time starts with anvil placement and firing of the circular stapler and ends with the end of the air leak test.

Post-operative complications:

Table 4: Comparison between group A and group B regarding postoperative complications among the studied patients

Complications	Group-A (Total=20)	Group-B (Total=20)	p-value
Postoperative leakage	1 (5.0%)	2 (10.0%)	0.999
Intraabdominal hemorrhage	1 (5.0%)	1 (5.0%)	0.999
Intraabdominal abscess	0 (0.0%)	1 (5.0%)	0.999
Wound complications	2 (10.0%)	2 (10.0%)	0.999
Ileus	1(5.0%)	1(5.0%)	0.999
Mortality	0 (0.0%)	0 (0.0%)	NA

Table 5: Comparison between group A and group B regarding length of stay and time to be open bowel among the studied patients

Variables		Group-A (Total=20)	Group-B (Total=20)	p-value
Time to be open bowel (days)	**Mean±SD**	1.8±0.88	2.6±1.18	**0.02***
	Range	1-4	1-5	
Length of hospital stay (days)	**Mean±SD**	6.5±1.7	7.0±2.6	0.438
	Range	5.0–12.0	4.0–15.0	

Group A had significant early postoperative bowel recovery compared to group B (P=0.02). Length of hospital stay was insignificantly different between both groups.

Table 6: Comparison between group A and group B regarding the range of bowel frequency at 3, 6, and 12 months among the studied patients.

Time	Frequency	Group-A (Total=20)	Group-B (Total=20)	p-value
Month 3	**1–3 /day**	7 (35.0%)	1 (5.0%)	**0.041***
	4–7 /day	2 (10.0%)	5 (25.0%)	
	>7 /day	11 (55.0%)	14 (70.0%)	
Month 6	**1–3 /day**	11 (55.0%)	5 (25.0%)	**0.048***
	4–7 /day	9 (45.0%)	11 (55.0%)	
	>7 /day	0 (0.0%)	4 (20.0%)	
Month 12	**1–3 /day**	13 (65.0%)	11 (55.0%)	0.519
	4–7 /day	7 (35.0%)	9 (45.0%)	

Group-A had less frequent postoperative bowel frequency, the differences were statistically significant in months 3 and 6. Functional outcomes at 12 months showed normalization of bowel movements both groups of patients, with no significant difference.

Table 7: Comparison between group A and group B regarding the urgency of defection at 3, 6, and 12 months among the studied patients

Time	Group-A (Total=20)	Group-B (Total=20)	p-value
Month 3	13 (65.0%)	19 (95.0%)	**0.044***
Month 6	11 (55.0%)	18 (90.0%)	**0.013***
Month 12	10 (50.0%)	14 (70.0%)	0.197

Group-A had less frequent postoperative urgency of defecation, the differences were statistically significant in months 3 and 6. By 12 months postoperatively, the difference between the two groups had diminished and was no longer statistically significant. These improvements over time are consistent with the natural course of bowel adaptation after operation.

DISCUSSION

The surgical approach is a critical determinant in averting anastomotic leaking after colorectal resections. Principles established to mitigate this risk include careful tissue manipulation, precise hemostasis, maintenance of sufficient blood perfusion, rigorous asepsis, and the formation of a tension-free anastomosis. Technical concerns that have garnered significant attention in the literature include the existence of crossed stapling lines and the development of "dog-ears" (protruding corners of the rectal stump with possibly impaired blood supply) in double-stapled technique (DST) anastomoses. Both characteristics are regarded as structural vulnerabilities that may lead to anastomotic leaking. The single-staple method (SST) was developed to mitigate these drawbacks by preventing overlapping staple lines and the creation of dog-ears **(9)**

According to the present study, baseline demographics such as age, gender distribution, body mass index (BMI), smoking status, and the prevalence of comorbidities such coronary artery disease, diabetes mellitus, and hypertension were identical for both groups. By reducing confounding bias, the homogeneity and consistent American Society of Anesthesiologists (ASA) classifications improve the validity of the comparative research.

With all patients categorized as stage III and free of distant metastases (M0), the two groups showed no discernible changes in tumor characteristics or TNM staging, ensuring similar tumor loads and surgical challenges for each group. Our results are supported by a prospective study conducted by ***Yang et al. (6)*** in which 232 patients were randomized (1:1) to either the end-to-end omega suture group or the traditional end-to-end anastomosis group. Individuals who had SST had similar tumor data, age, gender, body mass index, and American Society of Anesthesiologists grade (ASA) to those who received DST. This is consistent with the results of our investigation, which showed that there was no statistically significant difference in the demographic information between the two study groups ***(6)***.

Our study revealed a significant disparity between the two techniques, with both anastomosis time and total operative time being markedly longer in Group A (22.9 ± 3.4 minutes and 166.2 ± 7.9 minutes, respectively) compared to Group B (13.5 ± 4.9 minutes and 151.4 ± 6.9 minutes, respectively), yielding p-values <0.001 for both metrics. This is attributable to the time required for executing the omega suture.
Furthermore, the distance of the anastomosis from the anal margin and intraoperative problems, including blood loss and air leak tests, were minimal and not significantly varied between the two groups. Group A had one instance, whereas Group B had two incidences of positive intraoperative air leak testing. All instances were fixed using either single-layer or extramucosal sutures. Following anastomotic repair, air leak testing was conducted again. The data indicates that, when executed correctly, both procedures are safe and do not jeopardize intraoperative hemostasis or anastomotic integrity.
Our results are consistent with those of ***Vutukuru et al. (10),*** who found that the end-to-side and end-to-end cohorts had comparable ileostomy incidence, anastomosis level, preoperative chemoradiation, body mass index (BMI), nutritional status, and demographic features ***(10)***

Both groups had similar and low rates of postoperative complications. No one died in any of the groups. There was just one instance of anastomotic leakage in group A and two in group B. Patients with suspected leakage were identified as diabetic, smokers, and exhibited BMI. They underwent pelvi-abdominal CT scans with oral and IV contrast to confirm the leakage and were managed conservatively by maintaining NPO status, initiating broad-spectrum antibiotics, and monitoring clinical parameters (pulse, temperature, and serial abdominal examinations) alongside radiological evaluations for potential percutaneous drainage, which ultimately was unnecessary. The little leakage rate is significant and suggests that both procedures may be successfully implanted with meticulous patient selection and surgical accuracy.

Prior research has delineated various risk factors linked to anastomotic leakage, such as male gender, tobacco use, diabetes, and body mass index (BMI), with obese and morbidly obese individuals being especially susceptible to leakage ***(Emmertsen and Laurberg, (11); den Dulk et al., (12); Ward et al., 13).*** The ideal anastomotic technique—whether hand-sewn or stapled, and end-to-end or end-to-side—continues to be a topic of active discussion.

According to our findings, ***Roumen et al. (9)*** said that "the lateral intersections of double-stapled anastomoses represent a structural vulnerability, and that the most commonly utilized double-stapled anastomosis is a less effective variant compared to a complete circular anastomosis." Addressing this technical issue should diminish the incidence of anastomotic failures after low anterior resections" ***(9).***

Brunner et al. (7) reported a much decreased incidence of anastomotic leakage after minimally invasive colorectal resections using SST anastomoses in comparison to those employing DST anastomoses. Furthermore, the multivariate analysis indicated that DST is an autonomous risk factor for postoperative anastomotic leakage. Conversely, ***Radonovic et al. (19)*** and ***Kim et al. (2)*** observed no statistically significant changes in the leakage rates between patients with SST and DST anastomoses (SST: 6% vs. DST: 8%; p = 0.695, SST: 10% vs. DST: 8%; p = 0.711) respectively.

With a P value of 0.262 (2 occurrences, 3.6% in group A vs. 5 occurrences, 9.6% in group B), ***Abdwahed et al. (14)*** found no statistically significant difference in anastomotic leakage between the two groups.

In their comprehensive review and meta-analysis of randomized controlled trials, **McKechnie et al. (15)** found that five studies (83%) examined the incidence of anastomotic leakage between end-to-side and end-to-end configurations. When comparing end-to-side anastomosis to end-to-end anastomosis, their combined study showed a substantial decrease in anastomotic leak rates ($P < 0.04$).

According to our findings, ***Brisinda et al. (16)*** evaluated the surgical outcomes between a side-to-end anastomosis group of 40 patients and an end-to-end anastomosis group of 37 patients with T1 and T2 rectal cancer after laparoscopic resection. The authors determined that side-to-end anastomosis reduces the incidence of anastomotic leakage ***(16).***

The current investigation revealed that the time to the first bowel movement was considerably reduced in group A (1.8 ± 0.88 days) compared to group B (2.6 ± 1.18 days, $p = 0.02$), suggesting a more expedited recovery of gastrointestinal function. The prompt restoration of bowel function is therapeutically significant, as it diminishes the likelihood of extended ileus, enables the earlier commencement of dietary intake, and may lead to a reduced duration of hospitalization. Prior comparison investigations have shown inconsistent results based on the anastomotic method used. ***Liu et al. (17)*** noted no significant difference in the time to first flatus between end-to-side and functional end-to-end anastomoses after colorectal surgery (2.7 vs. 2.5 days).

The current investigation revealed no statistically significant differences in postoperative ileus, bleeding, intra-abdominal abscess, adhesive intestinal obstruction, tenesmus, wound complications, or duration of hospital stay. The data suggests that both anastomotic procedures provide comparable recovery patterns and do not significantly influence early postoperative therapy.
According to the findings, **Yang et al. (6)** reported that postoperative complications, including anastomotic bleeding, ileus, wound infection, and urinary tract infection, did not vary between the traditional end-to-end and end-to-end with omega suture groups (all $p > 0.05$). The postoperative recovery results indicated a significant reduction in both the duration of hospital stays and the time to the first bowel movement for patients in the SST group ($p = 0.032$ and $p = 0.005$, respectively) **(6).**

Postoperative bowel dysfunction constitutes a major issue after rectal surgery, often presenting as increased stool frequency, urgency, and fecal incontinence. In the current investigation, the urgency of defecation was somewhat less common in Group A than in Group B during the early postoperative phase. At three months, urgency was seen in 15 individuals from Group A and 18 patients from Group B. At six months, this decreased to 13 and 15 patients, respectively. At 12 months postoperatively, the disparity between the two groups had decreased and was no longer statistically significant. These improvements throughout time align with the normal progression of intestinal adaptation after resection and anastomosis.

The frequency of bowel movements exhibited the same trend. At three months, a greater percentage of patients in Group B reported 4–7 bowel motions per day compared to Group A (75% vs 55%), however this difference was not statistically significant. By 12 months, the majority of patients in both cohorts exhibited a normalization of 1–3 bowel movements per day (65% in Group A and 55% in Group B). The data indicates that whereas early postoperative bowel dysfunction is prevalent, both approaches provide progressive functional recovery without notable long-term disparities.

According to a study by **Rybakov et al. (18),** which was included as a conference abstract of a randomized controlled trial, there was no discernible difference between end-to-end and end-to-side anastomosis in terms of Wexner score, fecal incontinence quality of life scale, or maximum tolerated volume on anorectal volumetry.

A randomized controlled study comparing side-to-end and end-to-end colorectal anastomoses after laparoscopic low anterior resection was conducted by ***Planellas et al. (19).*** Significantly, end-to-end anastomosis improved intestinal function at 12 months in patients with tumors located in the low- to mid-rectum and was associated with lower rates of severe sequelae and re-interventions **(19).**

CLINICAL IMPLICATIONS

The findings of this prospective comparative study have meaningful clinical significance in the field of colorectal surgery. The comparison between *end-to-end anastomosis with omega suture* and *end-to-anterior rectal wall anastomosis* highlights the relative benefits and drawbacks of two single-stapled techniques in laparoscopic anterior resection for sigmoid and upper rectal cancer. Clinically, the omega suture technique (Group A) showed earlier postoperative bowel recovery and reduced urgency and frequency of defecation in the first six months after surgery, contributing to improved patient comfort and possibly faster return to daily activities. These findings suggest that the omega suture technique may be advantageous in enhancing short-term postoperative quality of life. However, since both methods showed comparable long-term outcomes and low complication rates, including similar incidences of anastomotic leakage, both techniques may be considered safe and effective options in routine surgical practice.

STRENGTHS OF THE STUDY

A key strength of the study is its prospective comparative design, which allows for a more controlled observation of outcomes between two well-defined groups. The surgical techniques were standardized and performed by experienced colorectal surgeons, reducing procedural variability and enhancing internal validity. The study population was homogeneous with no significant differences in age, gender, BMI, comorbidities, or tumor stage between the two groups, ensuring that observed differences were likely due to the intervention rather than confounding variables. Importantly, the study did not merely assess intraoperative or short-term complications, but extended its evaluation to functional bowel outcomes at 3, 6, and 12 months. This comprehensive

follow-up offers valuable insight into the patient-centered outcomes of each technique, especially regarding bowel function and urgency—critical components of postoperative quality of life.

LIMITATIONS

Despite its valuable contributions, this study has several notable limitations. First, the small sample size of only 40 patients limits the statistical power and the generalizability of the findings. Larger patient populations would allow for more robust detection of differences, particularly for rare events like anastomotic leaks or postoperative abscesses. Secondly, the study was conducted at a single institution, potentially introducing institutional or operator biases that may not reflect outcomes in different clinical settings. Additionally, the follow-up period was limited to 12 months, which, while sufficient for observing early and mid-term functional recovery, may not capture long-term oncological outcomes such as local recurrence or overall survival. Lastly, although functional outcomes were assessed, the study did not incorporate standardized quality-of-life scoring tools (e.g., LARS score or EORTC QLQ-CR29), which could have added further depth to the evaluation of patient well-being.

CONCLUSION

Both single-stapled anastomotic techniques—end-to-end anastomosis with omega suture (Group A) and end-to-anterior rectal wall anastomosis (Group B) demonstrated safety and efficacy following anterior resection for sigmoid and upper rectal cancer. Group A was associated with early bowel recovery and marginally improved short-term functional outcomes, albeit with a longer operative duration. In contrast, Group B offered reduced operative time but a slightly higher incidence of short-term urgency. Long-term oncological and functional outcomes were comparable between the two techniques. Technique selection may be guided by surgeon preference, anatomical factors, and institutional resources.

List of Abbreviations

- **ASA** – American Society of Anesthesiologists
- **BMI** – Body Mass Index
- **CT** – Computed Tomography
- **DST** – Double-Stapling Technique
- **ECG** – Electrocardiogram
- **IMV** – Inferior Mesenteric Vein
- **IMA** – Inferior Mesenteric Artery
- **MRI** – Magnetic Resonance Imaging
- **NPO** – Nil Per Os (nothing by mouth)
- **SST** – Single-Stapling Technique
- **SD** – Standard Deviation
- **SPSS** – Statistical Package for the Social Sciences

Ethical Considerations

This study was approved by the Research Ethics Committee of the Faculty of Medicine, Ain Shams University, Cairo, Egypt. All participants provided written informed consent prior to enrollment. The study was conducted in accordance with the principles outlined in the Declaration of Helsinki and all applicable regulatory requirements.

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Author Contributions

All authors have equal role, read and approved the final manuscript.

Conflicts of Interest

The authors declare that there are **no conflicts of interest** related to this research.

Confidentiality of Data

All patient data were handled with strict confidentiality. Identifiable information was anonymized and securely stored. Only authorized research team members had access to the data, in compliance with institutional data protection policies.

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