COMPARATIVE STUDY OF OPERATIVE TIME AND SURGICAL EFFICIENCY IN END-TO-END VERSUS SIDE-TO-END COLORECTAL ANASTOMOSIS FOR RECTAL CANCER.

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ABSTRACT:

Background: Colorectal cancer remains a critical global health issue, requiring effective treatment strategies to ensure the best possible patient outcomes. Low anterior resection is a key surgical procedure for managing rectal cancer, aimed at preserving gastrointestinal continuity while ensuring oncological effectiveness. The success of LAR is largely influenced by the choice of anastomotic technique, with side-to-end anastomosis and end-to-end anastomosis being the primary options. **Material & Methods:** The present study was a case control type of study which was carried out in the department of General Surgery, of our tertiary care hospital. The study duration was of six months. A sample size of 40 was calculated at 95% confidence interval at 10% acceptable margin of error. Only those patients who matched the inclusion and exclusion criteria were enrolled in present study. **Results:** The proportion of low anterior resections was slightly higher in the EEA group (80%) compared to the SEA group (65%), while ultralow resections were more frequently performed in the SEA group (35% vs. 20%) ($p > 0.05$). Mobilization of the splenic flexure was completed in all SEA patients (100%) and in 90% of EEA patients, ($p > 0.05$). Blood loss of less than 100 mL was observed in most patients from both groups (90% in SEA and 95% in EEA, ($p > 0.05$). Operative time, however, was significantly longer in the SEA group (173.0 ± 12.8 minutes) compared to the EEA group (140.0 ± 10.2 minutes, $p < 0.05$). Intraoperative anastomotic line bleeding was rare, occurring in 10% of EEA patients and 5% of SEA patients, ($p > 0.05$). **Conclusion:** We concluded from the present study that that SEA and EEA are equally effective in most clinical scenarios, with the choice of technique largely determined by surgical expertise and the patient's specific anatomical features.

Keywords: side-to-end anastomosis (SEA), end-to-end anastomosis (EEA), Low anterior resection (LAR)

INTRODUCTION:

The Colorectal cancer remains a critical global health issue, requiring effective treatment strategies to ensure the best possible patient outcomes. Low anterior resection (LAR) is a key surgical procedure for managing rectal cancer, aimed at preserving gastrointestinal continuity while ensuring oncological effectiveness **(1).** The success of LAR is largely influenced by the choice of anastomotic technique, with side-to-end anastomosis (SEA) and end-to-end

anastomosis (EEA) being the primary options. Anastomotic leakage (AL), defined as a failure in the surgical connection between two tubular structures, is a serious complication that significantly increases postoperative morbidity and mortality in colorectal surgery **(2).** Additionally, the importance of selecting the right anastomotic approach is underscored by the prevalence of low anterior resection syndrome (LARS), which encompasses the long-term functional consequences of rectal resection **(3).**

Advancements in surgical techniques and perioperative care have made LAR a standard treatment for low rectal cancer, leading to better oncological and surgical outcomes. However, despite these improvements, AL and LARS remain prevalent postoperative challenges, with AL rates ranging from 2% to 15%, even when temporary stomas are employed **(4).** Although straight coloanal anastomosis often produces favorable functional outcomes, many patients still experience frequent bowel movements, require antidiarrheal medications, and face varying degrees of incontinence **(5).** Adverse outcomes associated with LAR and direct coloanal anastomosis are often attributed to reduced reservoir capacity in the neorectum, which contributes to LARS **(6).**

Selecting the optimal anastomotic technique is a crucial aspect of colorectal surgery. SEA and EEA involve different approaches that may influence postoperative outcomes, particularly regarding AL and LARS. These challenges emphasize the importance of thoroughly evaluating SEA and EEA techniques in rectal cancer surgery. This study focuses on comparing operative time and surgical efficiency between SEA and EEA for rectal cancer, providing valuable insights into their respective benefits and drawbacks.

MATERIALS & METHODS

The present study was a case control type of study which was carried out in the department of General Surgery, of our tertiary care hospital. The study duration was of six months. A sample size of 40 was calculated at 95% confidence interval at 10% acceptable margin of error by epi info software version 7.3. Only those patients who matched the inclusion and exclusion criteria were enrolled in present study. Institutional Ethics Committee Clearance was obtained before start of study and written and informed consent for the procedure was obtained from all the patients. Strict confidentiality was maintained with patient identity and data and not revealed, at any point of time.

Patients were enrolled and evenly divided into two groups before surgery: the SEA anastomosis group (Group B) and the EEA anastomosis group (Group A). The integrity of the anastomosis was evaluated using digital rectal examination (DRE), while functional outcomes were assessed using the LARS score on the 14th postoperative day (POD) and during follow-ups at the 1st, 3rd, and 6th postoperative months. Inclusion criteria included patients aged 18 years or older with stage I, II, or III mid- to low-rectal adenocarcinomas, who had provided informed consent and were capable of understanding the study questionnaire. Exclusion criteria encompassed individuals with stage IV rectal carcinoma, recurrent rectal cancer, obstructed or perforated rectal carcinoma, uncontrolled diabetes, low serum albumin levels, inadequate preoperative optimization, or those over the age

of 65. All data were entered in the MS office 2010 spread sheet and Epi Info v7. Data analysis was carried out using SPSS v22. Qualitative data was expressed as percentage (%) and Pearson's chi square test was used to find out statistical differences between the study groups and sensitivity, specificity, positive predictive value and negative predictive value were calculated. If the expected cell count was < 5 in more than 20% of the cells then Fisher's exact test was used. All tests were done at alpha (level significance) of 5%; means a significant association present if p value was less than 0.05 and highly significant if p value less than 0.01.

RESULTS

In the present study, we enrolled 40 patients were enrolled and evenly divided into two groups before surgery: the SEA anastomosis group (Group B) and the EEA anastomosis group (Group A) at our tertiary care hospital during the study duration. Only those patients who matched the inclusion and exclusion criteria were enrolled in present study. The American Society of Anesthesiologists Physical Status (ASA PS) classification revealed no statistically significant differences between the SEA and EEA groups. In ASA PS class I, 20% of patients in the EEA group and 25% in the SEA group were categorized. Class II included 20% of patients in the EEA group and 15% in the SEA group. The majority of patients in both groups fell under class III (50% and 45%), while class IV accounted for 15% in the EEA group and 10% in the SEA group, with a p-value of >0.05, indicating no significant difference between the groups.

At three months post-surgery, LARS scores demonstrated similar distributions between the SEA and EEA groups. Major LARS was observed in 30% of patients in the EEA group and 20% in the SEA group. Minor LARS was slightly more prevalent in the SEA group (50%) compared to the EEA group (60%). An equal proportion of patients in both groups (30%) experienced no LARS. The p-value >0.05 indicates no statistically significant difference between the groups regarding LARS severity. (Table 1)

In the present study, out of total study participants, based on the Intraoperative variables revealed some differences between the EEA and SEA groups. The proportion of low anterior resections was slightly higher in the EEA group (80%) compared to the SEA group (65%), while ultralow resections were more frequently performed in the SEA group (35% vs. 20%). However, these differences were not statistically significant ($p > 0.05$). Mobilization of the splenic flexure was completed in all SEA patients (100%) and in 90% of EEA patients, with no significant difference ($p > 0.05$). Blood loss of less than 100 mL was observed in most patients from both groups (90% in SEA and 95% in EEA, ($p > 0.05$).

Operative time, however, was significantly longer in the SEA group (173.0 ± 12.8 minutes) compared to the EEA group (140.0 ± 10.2 minutes, $p < 0.05$). Intraoperative anastomotic line bleeding was rare, occurring in 10% of EEA patients and 5% of SEA patients, with no statistically significant difference ($p > 0.05$). (Table 2).

Table 1: Distribution of study participants according to study parameters.

Study parameters		Group A (n=20) EEA	Group B (n=20) SEA	P value
ASA classification	I	4 (20%)	5 (25%)	> 0.05
	II	4 (20%)	3 (15%)	
	III	9 (45%)	10 (50%)	
	IV	3 (15%)	2 (10%)	
Postoperative LARS score at 3 months	Major LRS (30-42)	6 (30%)	4 (20%)	> 0.05
	Minor LRS (21-29)	10 (50%)	12 (60%)	
	No LRS (0-20)	6 (30%)	6 (30%)	

Table 2: Distribution of study participants according to study parameters.

Study parameters		Group A (n=20) EEA	Group B (n=20) SEA	P value
Anterior resection	Low	16 (80%)	13 (65%)	> 0.05
	Ultra low	4 (20%)	7 (35%)	
Mobilization of the splenic flexure	Yes	18 (90%)	20 (100%)	> 0.05
	No	2 (10%)	0 (00%)	
Blood loss (ml)	<100 ml	19 (95%)	18 (90%)	> 0.05
	>100 ml	1 (5%)	2 (10%)	
Operative time (min)		140.0 ± 10.2	173.0 ± 12.8	< 0.05
Intraoperative anastomotic line bleeding		2 (10%)	1 (5%)	> 0.05

DISCUSSION

In the present study, we enrolled 40 patients were enrolled and evenly divided into two groups before surgery: the SEA anastomosis group (Group B) and the EEA anastomosis group (Group A) at our tertiary care hospital during the study duration. Only those patients who matched the inclusion and exclusion criteria were enrolled in present study. The American

Society of Anesthesiologists Physical Status (ASA PS) classification revealed no statistically significant differences between the SEA and EEA groups. In ASA PS class I, 20% of patients in the EEA group and 25% in the SEA group were categorized. Class II included 20% of patients in the EEA group and 15% in the SEA group. The majority of patients in both groups fell under class III (50% and 45%), while class IV accounted for 15% in the EEA group and 10% in the SEA group, with a p-value of >0.05, indicating no significant difference between the groups. Similar findings were reported in a study conducted by Fayek IS among 50 patients with mid and low rectal tumors reported similar results in their study **(7).**

In the present study, at three months post-surgery, LARS scores demonstrated similar distributions between the SEA and EEA groups. Major LARS was observed in 30% of patients in the EEA group and 20% in the SEA group. Minor LARS was slightly more prevalent in the SEA group (50%) compared to the EEA group (60%). An equal proportion of patients in both groups (30%) experienced no LARS. The p-value >0.05 indicates no statistically significant difference between the groups regarding LARS severity. Similar findings were reported in a study conducted by Yuan-Chuan Zhang et al among 46 (16 and 30 two groups) patients with mid and low rectal tumors reported similar results in their comparative study **(8).**

In the present study, out of total study participants, based on the Intraoperative variables revealed some differences between the EEA and SEA groups. The proportion of low anterior resections was slightly higher in the EEA group (80%) compared to the SEA group (65%), while ultralow resections were more frequently performed in the SEA group (35% vs. 20%). However, these differences were not statistically significant ($p > 0.05$). Mobilization of the splenic flexure was completed in all SEA patients (100%) and in 90% of EEA patients, with no significant difference ($p > 0.05$). Blood loss of less than 100 mL was observed in most patients from both groups (90% in SEA and 95% in EEA, ($p > 0.05$). Similar findings were reported in a study conducted by Zheng Liu et al among 379 patients with colorectal cancer reported similar results in their comparative study **(9).**

In the present study, out of total study participants, based on the operative time, however, was significantly longer in the SEA group (173.0 ± 12.8 minutes) compared to the EEA group (140.0 ± 10.2 minutes, $p < 0.05$). Intraoperative anastomotic line bleeding was rare, occurring in 10% of EEA patients and 5% of SEA patients, with no statistically significant difference ($p > 0.05$). Similar findings were reported in a study conducted by Carlos Placer et al among 302 patients with colorectal cancer reported similar results in their study and found statistically significant difference between both groups ($p < 0.05$) **(10).**

CONCLUSION

We concluded from the present study that this study underscores the comparable outcomes of SEA and EEA techniques in colorectal cancer surgery, highlighting both as viable surgical options. The two approaches demonstrated similar preoperative patient characteristics and intraoperative safety, with no significant differences observed in ASA PS classification,

splenic flexure mobilization, or intraoperative anastomotic line bleeding. Although operative time was notably longer for SEA, this did not result in higher complication rates. Functional outcomes, evaluated using LARS scores, were similar in both groups, with only minor differences in severity. These results indicate that SEA and EEA are equally effective in most clinical scenarios, with the choice of technique largely determined by surgical expertise and the patient's specific anatomical features.

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