ORIGINAL ARTICLE

COMPARISON OF THE OUTCOMES OF ENHANCED RECOVERY AFTER SURGERY (ERAS) VS CONVENTIONAL CARE IN ELECTIVE COLORECTAL SURGERY

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Background: Uncontrolled cell development in the colon, rectum, or appendix is the cause of colorectal cancer, sometimes referred to as colon cancer, rectal cancer, or bowel cancer. Its incidence is higher in developed countries than in developing ones. About 75–95% of cases occur in individuals without significant genetic risk. The aim of Enhanced Recovery After Surgery (ERAS) or fast-track surgery involves the use of several perioperative strategies to facilitate better surgical conditions to achieve faster recovery of the patients which has shown better outcomes in different surgery types. This study aims to compare the outcome of ERAS vs conventional care in elective colorectal surgery. **Methods:** In this randomized controlled trial, 60 patients undergoing elective colorectal surgery were assessed by dividing them into two groups. Group A patients followed ERAS protocols, while Group B patients followed conventional care techniques. Time for bowel sounds and first flatus were noted. Mean hospital stay was recorded for each patient from operation to discharge. Patients were followed for 4 weeks for surgical site infection assessment. **Results:** The mean time to return bowel sounds in Group A was 20.63±2.66 hours while in Group B was 27.0±2.07 hours (p-value =0.0001). The mean time to passage of the first flatus in Group A was 18.67±2.38 hours while in Group B was 25.93±2.88 hours (p-value =0.0001). The mean hospital stay in Group A was 3.37±1.75 days while in Group B was 8.30±1.68 days (p-value =0.0001). Surgical site infection was found in 04 (13.33%) patients in group A while in group B, it was found in 09 (30.0%) patients with a p-value of 0.1172. **Conclusion:** This study concludes that the outcome of enhanced recovery after surgery (ERAS) is better than conventional care in elective colorectal surgery.

Keywords: Colorectal cancer; ERAS protocol; Perioperative strategies; Comparative study; Elective colorectal surgery

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INTRODUCTION

Uncontrolled cell development in the colon, rectum, or appendix is the cause of colorectal cancer, sometimes referred to as colon cancer, rectal cancer, or bowel cancer.[1] Its incidence is higher in developed countries than in developing ones. About 75–95% of cases occur in individuals without significant genetic risk.[2] Risk factors include age, gender, high fat intake, alcohol, red meat consumption, obesity, smoking, and lack of exercise.[3] Diagnosis through screening can precede symptoms by 2–3 years. The majority of cases result from lifestyle and age, with only a minority linked to genetic conditions. If treatment is not received, the cancer, which usually begins in the lining of the gut, can spread to the muscular layers underneath and eventually through the intestinal wall.[4]

Despite advancements in modern surgical techniques, morbidity following abdominal surgery remains substantial. Compared to other general surgical procedures, colorectal surgery carries a heightened risk of morbidity and mortality. Mortality rates range from 1–16.4%, with morbidity rates as high as 35%.[5,6] Evidence-based medicine has driven practice changes and improved outcomes over the past two decades. However, practices like preoperative bowel preparation, nasogastric tube usage, and postoperative nil-by-mouth orders until bowel sounds return are still common, despite lacking evidence. Factors like pain, immobilization, and postoperative ileus can lead to extended hospital stays (over 10 days) and complication rates of 48% following major colorectal surgery.[5,6]

Fast-track surgery, also known as Enhanced Recovery After Surgery (ERAS) or multimodal surgery, employs perioperative strategies to enhance surgical conditions, accelerate recovery, and achieve early hospital discharge. ERAS protocols consistently reduce length of stay (LOS) without affecting complication or readmission rates.[7,8] In a study, the ERAS group demonstrated nearly 60% less hospital stay duration, complications, and costs compared to the non-ERAS group, with high patient satisfaction.[9] The mean length of hospital stay with ERAS was 11 days, compared to 13 days with standard treatment (p =0.034) in a 2018 research by Ripollés-Melchor *et al.*[10] Another study[11] involved 186 patients under an ERAS

program compared to 184 patients receiving conventional postoperative care. The median hospital stay was shorter in the ERAS group: 7.27±1.83 days vs. 8.85±2.18 days. The findings of another study[12] suggest that ERPs may benefit patients' reported postoperative health status and symptom experience following abdominal surgery; nevertheless, the majority of the data came from low-quality research.

Although numerous studies confirm ERAS benefits in elective surgery, its feasibility and effectiveness in elective colorectal surgery remain unknown. This study aims to compare ERAS and conventional care outcomes in elective colorectal surgery. The results will inform routine practice guidelines for optimal patient outcomes, potentially leading to reduced hospitalization time and costs. Given the study's relevance in a heavily populated area with limited medical resources, its findings could alleviate patient burden, enhance bed availability, and provide valuable insights for local surgeons.

MATERIAL AND METHODS

The study was a randomized controlled trial and conducted at the Department of Surgery (Surgical Unit II) in Bahawal Victoria Hospital, Bahawalpur. The research was carried out from February 3, 2022, to August 20, 2023. The sample size was determined using the WHO calculator for two means, resulting in a calculated sample size of 60 participants, with 30 cases in each group. The study employed a 5% significance level and 90% power, considering the mean length of hospital stay as 3.8±1.95 days with ERAS compared to 8.5±1.52 days with conventional care.[8] The sampling technique employed was non-probability consecutive sampling.

Inclusion criteria encompassed patients undergoing elective colorectal surgery, spanning various procedures such as colectomies (including right or left hemicolectomies), anterior resection, total colectomies, abdomino-perineal resection, and low anterior resection with resection of the tumor and primary anastomosis without stoma. These surgeries targeted individuals within the age range of 20 to 50 years, irrespective of gender. Conversely, exclusion criteria delineated patients with specific medical backgrounds, notably those with a history of pelvic irradiation, chronic renal failure (determined by history and serum creatinine levels exceeding 1.5 mg/dl), or chronic liver disease (determined by history and serum bilirubin levels surpassing 2.0 mg/dl). Additionally, individuals with recent immunomodulatory medication reactions, active infections, or a history of autoimmune illness, recurrent colorectal cancer, cardiovascular disease, coagulopathies, or diabetic mellitus were excluded from the study.

Patients who took part in the study agreed in writing to have their data used for analysis after signing an informed consent form about the operation and any follow-up care. The Ethical Review Board of the study's institution (no. 1277/DME/QAMC) granted ethical approval. All study methods were carried out in accordance with the Declaration of Helsinki's principles and ethical guidelines. A total of sixty patients who met the inclusion criteria and were admitted to the surgery department at Bahawal Victoria Hospital in Bahawalpur were chosen. Age, gender, height, weight, BMI, and kind of operation were recorded following informed permission. Every chosen instance was given the option to select a slip from a completely mixed-up set. The letter "A" was on half of the slips, while the letter "B" was on the other half. and he or she was assigned to the particular group they chose. The ERAS guidelines were strictly followed when performing colorectal surgery on the patients in Group A. Implementing the Enhanced Recovery After Surgery (ERAS) protocol included preoperative education (informing patients about the surgical process and recovery), preoperative fasting (encouraging clear fluid intake hours before surgery), multimodal analgesia (using various pain management techniques), early ambulation (prompt post-surgery movement for faster recovery), nutritional support (addressing pre and post-operative needs), and minimally invasive techniques (reducing tissue trauma). These interventions, along with individualized care plans, tailored to factors like age and health status, comprised the ERAS approach. On the other hand, Group B patients had colorectal surgery performed without concern for the ERAS procedures, utilizing the standard care method. The institution's standard protocols include holding off on beginning enteral feeding for a minimum of eight hours, keeping the abdominal drain in place until the fluid level is <50 ml, providing adequate analgesia, including opioids, and preparing the colon for surgery by starting a soft diet 3 days beforehand and switching to a liquid diet 16 hours before the procedure. In each group, a single consultant surgeon (having at least five years of post-fellowship experience) carried out every surgery. Until the patient was discharged from the ward, the researcher followed up with each patient on a regular basis to address any concerns. The initial flatus passage and the resumption of bowel sounds were recorded. Every patient in both groups had a mean hospital stay from the day of surgery until the day of discharge. For four weeks, every patient was monitored to see whether they had a surgery site infection. We followed up with each patient by calling their phone numbers. Individuals who did not follow up were not included. Outcome was measured in terms of following;

a. Hospital stay: Days were used to quantify this. The day of the procedure was the start time, and the day the patient was discharged from the ward following stabilization and without any complications was the finish time.
b. Time to return of bowel sounds: Mean postoperative time interval to first hearing of normal intestinal sounds (on auscultation).

c. Time to passage of first flatus: Mean postoperative time interval to first passage of flatus (measured in hours)
d. Surgical site infections (SSIs): presence of purulent discharge and resulting in opening of the skin wound within 4 weeks after operation was deemed as positive.

The formula used to compute Body Mass Index (BMI) was BMI = weight in kilograms/height in meters squared. A value of >25 was considered obese, while a value of ≤25 was considered non-obese.

All the data was entered and analyzed by SPSS version 25.0. Shapiro wilk test was used to check the normality of data. The following data were displayed as mean and standard deviation or median (IQR): age, height, weight, BMI, time to first flatus passage, time to return of bowel sounds, surgical time, and length of hospital stay. SSI, gender, and operation type were shown as percentages and frequencies. The mean time for the return of bowel sounds, the time to the first flatus, the length of hospital stay for both groups were compared using an independent "t" test/ANOVA test. Chi square/fisher exact test was used for Surgical Site Infections (SSIs). The *p*-value ≤0.05 was considered as significant.

Effect modifiers like age, gender, BMI, operative time and type of surgery were controlled through stratification and post-stratification Independent 't' test was applied for quantitative outcome and chi square/fisher exact test for qualitative outcome. The *p*-value ≤0.05 was considered as significant.

RESULTS

Age range in this study was from 20–50 years with mean age of 30.43±8.27 years. The mean age of patients in group A was 29.87±8.28 years and in group B was 31.03±8.26 years. Majority of the patients 40 (66.67%) were between 20 to 35 years of age.

Out of 60 patients, 37 (61.67%) were males and 23 (38.33%) were females with male to female ratio of 1.6:1. Mean BMI was 27.72±3.43 kg/m2. Mean operation time was 148.24±20.21 minutes.

In our study, mean time to return of bowel sounds in Group A (Enhanced Recovery After Surgery protocols group) was 20.63±2.66 hours while in Group B (conventional group) was 27.0±2.07 hours (*p*-value = 0.0001). Mean time to passage of first flatus in Group A (Enhanced Recovery After Surgery protocols group) was 18.67±2.38 hours while in Group B (conventional group) was 25.93±2.88 hours (*p*-value =0.0001). Surgical site infection was found in 4 (13.33%) patients in group A while in group B, it was found in 09 (30.0%) patients with *p*-value of 0.1172.

Stratification of time to return of bowel sounds with respect to age, gender, BMI, operative time and type of surgery is shown in Table 2. Stratification of time to passage of first flatus with respect to age, gender, BMI, operative time and type of surgery is shown in Table 3. Stratification of hospital stay with respect to age, gender, BMI, operative time and type of surgery is shown in Table 4. Stratification of SSI with respect to age, gender, BMI, operative time and type of surgery is shown in Table 5.

Table-1: Comparison of outcome of enhanced recovery after surgery (ERAS) vs conventional care in elective colorectal surgery

	Group A (n=30)	Group B (n=30)	*p*-value
	Mean±SD	Mean±SD	
Time to return of bowel sounds (hrs)	20.63±2.66	27.0±2.07	0.0001
Time to passage of first flatus (hrs)	18.67±2.38	25.93±2.88	0.0001
Hospital stay (days)	3.37±1.75	8.30±1.68	0.0001

Table-2: Stratification of time to return of bowel sounds with respect to age, gender, BMI, operative time and type of surgery

		Group A (n=30)		Group B (n=30)		*p*-value
		Time to return of bowel sounds (hrs)		Time to return of bowel sounds (hrs)		
		Mean	SD	Mean	SD	
Age (years)	20–35	20.41	2.56	27.22	1.99	0.0001
	36–50	21.25	3.01	26.67	2.23	0.0001
Gender	Male	20.39	2.52	27.0	1.97	0.0001
	Female	21.0	2.92	27.0	2.32	0.0001
BMI (kg/m^2)	≤25	19.90	3.07	27.27	2.37	0.0001
	>25	21.0	2.43	26.84	1.92	0.0001
Type of surgery	Rectal	21.0	2.48	26.86	2.18	0.0001
	Colon	20.35	2.83	27.13	2.03	0.0001
Operation time	≤150 min	21.12	2.55	27.44	2.36	0.0001
	>150 min	20.0	2.77	26.33	1.37	0.0001

Table-3: Stratification of time to passage of first flatus with respect to age, gender, BMI, operative time and type of surgery

		Group A (n=30) time to passage of first flatus (days)		Group B (n=30) time to passage of first flatus (days)		*p*-value
		Mean	SD	Mean	SD	
Age (years)	20–35	18.32	2.30	26.22	3.06	0.0001
	36–50	19.63	2.50	25.50	2.65	0.0001
Gender	Male	19.06	2.29	25.47	3.08	0.0001
	Female	18.08	2.50	26.73	2.41	0.0001
BMI (kg/m^2)	≤25	19.0	2.36	26.0	3.13	0.0001
	>25	18.50	2.44	25.89	2.81	0.0001
Type of surgery	Rectal	17.69	2.29	26.0	2.48	0.0001
	Colon	19.41	2.24	25.88	3.26	0.0001
Operation time	≤150 min	18.12	2.50	26.39	2.83	0.0001
	>150 min	19.38	2.10	25.25	2.93	0.0001

Table-4: Stratification of hospital stay with respect to age, gender, BMI, operative time and type of surgery.

		Group A (n=30) Hospital stay (days)		Group B (n=30) Hospital stay (days)		*p*-value
		Mean	SD	Mean	SD	
Age (years)	20–35	3.55	1.87	8.28	1.81	0.0001
	36–50	2.88	1.36	8.33	1.56	0.0001
Gender	Male	2.89	1.28	8.11	1.52	0.0001
	Female	4.08	2.15	8.64	1.96	0.0001
BMI (kg/m^2)	≤25	3.80	1.99	8.45	2.16	0.0001
	>25	3.15	1.63	8.21	1.40	0.0001
Type of surgery	Rectal	2.92	1.75	8.43	1.91	0.0001
	Colon	3.71	1.72	8.19	1.52	0.0001
Operation time	≤150 min	3.59	1.84	8.39	1.65	0.0001
	>150 min	3.08	1.66	8.17	1.80	0.0001

Table-5: Stratification of SSI with respect to age, gender, BMI, operative time and type of surgery

		Group A (n=30) SSI		Group B (n=30) SSI		*p*-value
		Yes	No	Yes	No	
Age (years)	**20–35**	04 (18.18%)	18 (81.82%)	06 (33.33%)	12 (66.67%)	0.271
	36–50	00 (0.0%)	08 (100.0%)	03 (25.0%)	09 (75.0%)	0.125
Gender	**Male**	03 (16.67%)	15 (83.33%)	04 (21.05%)	15 (78.95%)	0.734
	Female	01 (8.33%)	11 (91.67%)	05 (45.45%)	06 (54.55%)	0.043
BMI (kg/m^2)	**≤25**	01 (10.0%)	09 (90.0%)	05 (45.45%)	06 (54.55%)	0.073
	>25	03 (15.0%)	17 (85.0%)	04 (21.05%)	15 (78.95%)	0.623
Type of surgery	**Rectal**	02 (15.38%)	11 (84.62%)	05 (35.71%)	09 (64.29%)	0.228
	Colon	02 (11.76%)	15 (88.24%)	04 (25.0%)	12 (75.0%)	0.325

DISCUSSION

Evidence-based interventions created to lessen perioperative stress, preserve postoperative physiological function, and hasten recovery after surgery are included in the Enhanced Recovery After Surgery (ERAS) Society care pathways. After major colorectal surgery, using a technique like this multimodal stress-minimizing strategy has consistently been demonstrated to lower rates of morbidity, enhance recovery, and decrease length of stay (LOS).[13,14]

With regard to elective colorectal surgery, we undertook this study to evaluate the results of enhanced recovery after surgery (ERAS) with standard care. In Group A (Enhanced Recovery After Surgery protocols group), the average hospital stay was 3.37±1.75 days, compared to 8.30±1.68 days in Group B (traditional group) (*p*-value =0.0001). In a recent research, patient satisfaction was very high in the ERAS group, and the length of hospital stays, complications, and expenses were all shown to be approximately 60% lower than in the non-ERAS group.[9] Increased ERAS adherence seems to be linked to a decrease in postoperative complications, according to Ripollés-Melchor J *et al*.[10] In another study[11], 184 patients getting standard postoperative care were compared to 186 patients receiving the ERAS program. In the ERAS group, the median hospital stay was shorter (7.27±1.83 vs. 8.85±2.18 days). In both groups, wound infection was determined to be 1.1%. Our study findings align with these previous researches in terms of shorter hospital stays, indicating that increased adherence to ERAS protocols correlates with better outcomes in elective colorectal surgery when compared to traditional non-

ERAS protocols. These studies also showed lesser SSIs which is in contrast to our findings, that showed non-significant relation between the SSIs among both the groups.

Postoperative complications significantly decreased, according to a single-center prospective cohort research (OR = 0.73; 95% CI 0.55–0.98). Preoperative and postoperative adherence to the ERAS procedure increased overall from 43.3–70.6%.[13] A recent review revealed that Enhanced Recovery After Surgery has been demonstrated to enhance results after nearly all major surgical specialties, but it began primarily with colorectal surgery. Value-based care in surgery is shown by ERAS, which is implemented with significant improvements in cost and clinical outcomes.[15]

In a separate study Saurabh *et al*.[16] involving thirty-five patients of emergency small bowel surgery comparing adapted ERAS and standard care groups, significant benefits were observed in the ERAS group. These included earlier recovery in terms of first fluid diet, first solid diet, time to first flatus, and first stool. Postoperative complications such as nausea, vomiting, pulmonary issues, and surgical site infections were similar between the ERAS and standard care groups. However, the ERAS group exhibited a significantly shorter length of hospital stay compared to the standard care group (8±0.38 vs. 10.83±0.42; Mean difference, 2.83±0.56; p<0.001). Comparatively, our study on elective colorectal surgery aligns with these findings even though our subjects were undergoing elective operation as compared to small bowel emergencies in that study by Saurabh *et al*., indicating that ERAS implementation is associated with a quicker recovery, reflected in faster postoperative milestones, and a significantly shorter hospital stay, irrespective of the surgery type. Both studies highlight the positive impact of ERAS protocols on enhancing the perioperative experience for colorectal surgery patients.

In a distinct investigation[17] that compared adapted ERAS and standard care groups comprising 59 and 61 patients, respectively, which were the cases of perforation peritonitis. The adapted ERAS cohort exhibited a notable 3-day reduction in hospital stay (p<0.001) and significant advancements in recovery milestones compared to the standard care group. Noteworthy reductions in postoperative complications, including nausea, vomiting (p=0.05), and surgical site infections (p<0.001), were observed in the adapted ERAS group. Our study on elective colorectal surgery echoes these outcomes, underscoring the positive influence of ERAS protocols on postoperative results. Despite the different surgical contexts, outcomes were better in the study groups in which ERAS protocols were followed.

The most recent research was a multicenter one from China that was published by Shang *et al*[18] in 2018. Eight hundred and thirty-nine patients with acutely blocked colorectal cancer had emergency resection in 4 hospitals during the course of the 8-year research. There were 318 patients in each group after propensity score matching study comparing ERAS and conventional perioperative treatment. The median hospital stay for the ERAS group was shorter (6 days vs. 9 days), the time from surgery to adjuvant chemotherapy was shorter (36 days vs. 48 days), and there were considerably fewer problems (34% vs. 45%). Compared to our study on elective colorectal surgery, Shang *et al*.'s[18] research on emergency resection for acutely blocked colorectal cancer in China showed consistent advantages with ERAS protocols, including shorter hospital stays, quicker initiation of adjuvant chemotherapy, and lower complication rates.

An umbrella review[19] was recently done to systematically assess the effects of ERAS pathways on multiple clinical outcomes in surgery. The umbrella review, encompassing 23 meta-analyses of interventional and observational studies, provides comprehensive insights into ERAS programs across various surgeries. Our study on elective colorectal surgery aligns with the overarching findings, as ERAS programs consistently demonstrate a significant reduction in the length of hospital stay and costs compared to traditional perioperative care. Similar to the umbrella review's conclusions, our study also emphasizes the safety and efficiency of ERAS programs in surgery patients. However, the precautionary note for gastric cancer surgery, highlighted in the umbrella review due to increased readmission rates and morbidity in certain cases, is a notable consideration for specific surgical contexts. Reduced surgical stress response has frequently been shown to reduce overall morbidity, length of stay, and expenses.[13]

CONCLUSION

This study concluded that outcome of Enhanced Recovery After Surgery (ERAS Protocols) is better than conventional care in elective colorectal surgery in terms of shorter hospital stays, early return of bowel sounds and reduced surgical site infections. So, we recommend that ERAS protocols in patients undergoing colorectal surgery should be adopted routinely in order to decrease the post-operative morbidity of these particular patients.

AUTHORS' CONTRIBUTION

MTI: Conceptualization of the study design. MTI, AUJ: FMA: Data collection, data analysis, data interpretation, write-up, proofreading.

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