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Original article

Enhanced Recovery Programs versus Conventional Perioperative Care in Elective Open Left Side Colonic Carcinoma Surgery: A Randomized Controlled Trial

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Abstract:

Background: Enhanced recovery programs (ERP) have been used to lower costs and improve surgical results, per contemporary clinical practice standards. However, the conventional methods of treating colorectal cancer, which are still based on the idea of protecting anastomosis and reducing postoperative problems, continue to resist them. **Objective:** This study compared the effects of ERP and traditional perioperative care following open elective surgery for left colonic cancer. **Methodology:** 62 patients with left-side colon cancer were included in the current randomized controlled study and allocated into 2 equal groups at random: group (A) received standard perioperative care, and group (B) received ERP. A minimum of one month of follow-up was planned. **Results:** Patients of both groups did not exhibit statistically significant differences in terms of preoperative comorbidities. Group A's mean operative time was 171.9 ± 12.4 while group B's was 152.2 ± 17.1 (P = 0.038). Patients in group B reported significantly less discomfort than those in group A (P = 0.016*). Except for PONV, which were significantly lower in group B. **Conclusion:** When compared to standard care, ERP are safe, dependable, easy to use, and applicable in open left side cancer colon surgery with no detrimental effects on postoperative problems.

Keywords: colon cancer; ERP; Perioperative care.

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Introduction

Historically, colorectal surgery has been linked to high expenses, lengthy hospital stays following surgery, and rates of surgical site infections that are close to 20% [1]. Furthermore, readmission rates might reach 35% [2] and the prevalence of in-hospital perioperative nausea and vomiting (PONV) can reach 80% [3]. Patients undergoing elective surgery are subjected to a set of standardized perioperative procedures known as enhanced recovery protocols (ERPs), the substance of which might vary greatly. Although these protocols are generally not meant for non-elective cases, ERP components might undoubtedly be used for patients who are urgent or emergent [4].

The goal of enhanced recovery protocols, also referred to as "fast track" or "enhanced recovery after surgery" (ERAS) procedures, is to improve patient outcomes [5]. Achieving an early recovery of bowel function, reducing the length of hospital stay and wound infection rates, and lowering pain and nausea are all noteworthy outcomes [6]. This clinical practice guideline will assess the evidence supporting specific actions to enhance patient outcomes following elective colon and rectal resections, even though there are several perioperative procedures available.

ERPs lower length of stay and morbidity rates without increasing the rate of readmission [7,8]. When compared to traditional perioperative patient management, ERPs were linked to lower overall complication rates and duration of stay, according to a 2011 Cochrane review [9]. ERPs have been linked to lower healthcare expenses and lower morbidity and mortality, according to later research [1, 10-13].

Regardless of whether patients have open or laparo-scopic surgery, ERPs are likewise linked to better results [14]. Furthermore, a few studies have demonstrated the safety and effectiveness of ERPs in patient populations who are elderly [15,16]. ERPs should not be installed and maintained in a dogmatic manner, according to studies; instead, they should be continuously evaluated for compliance and their quality should be continuously improved [17]. Shorter length of stay (LOS) and fewer complications are linked to higher ERP adherence [18].

A typical ERP consists of numerous preoperative, intraoperative, and postoperative components, and it can be challenging to determine which of the "bundle" of concurrently administered measures are most advantageous. The evidence about several ERP components for colorectal surgery will be assessed by this clinical practice recommendation. Although this CPG discusses ostomy surgery, bowel preparation, frailty, and deep vein thrombosis (DVT) prophylaxis, a thorough examination of these subjects is outside the purview of this CPG; they are covered in length in other ASCRS Clinical Practice Guidelines [19,20].

This study compared the effects of ERP and traditional perioperative care on the postoperative outcome following open elective surgery for left colonic cancer.

Patients and methods

Study design

From December 2023 to January 2025, the current prospective randomized controlled study was carried out at the Department of Surgery at Faculty of Medicine, Benha University.

Sixty-two patients with stage I or II left colonic cancer who qualify for elective resection—sigmoidectomy, left hemicolectomy, or extended left hemicolectomy were included in the study. Patients with advanced, perforated, or obstructed colon cancer were excluded. Patients who were immunocompromised, had an ASA score greater than 3, or were contraindicated for regional anesthesia were also not included.

Two equal groups, A and B, will be randomly selected from among the

patients. ERP will be used to manage patients in group B, whereas traditional perioperative care will be used to manage patients in group A.

Every patient in this study underwent a thorough history taking, a comprehensive clinical examination, and all preoperative tests, including a biopsy and colonoscopy, as well as a comprehensive metastatic workup.

Randomization double-blind was done using software, (Random Allocation Software 1.0, 2011). This block randomization was carried out by a separate researcher.

Procedure

Group A Patients received standard treatment, which includes preoperative anesthetic evaluation, admission 2 days before surgery with prophylactic heparin, colonic preparation, antibiotics, and an eight-hour fast before operation. The use of general anesthesia, which was induced with propofol and rocuronium and maintained by sevoflurane inhalation and intermittent injections of rocuronium, was one of the intraoperative measures. Analgesia was achieved with narcotics.

Regular placement of intraperitoneal drains and the nasogastric tube. Until the 3rd postoperative day, when oral fluids and a regular diet are permitted, postoperative care will involve NPO. On-demand mobilization will be carried out with the assistance of the nursing personnel. Ketoprofen and paracetamol infusion will be used to manage postoperative discomfort.

Group B: The ERP parameters outlined in the most recent guidelines were used. Along with accurately identifying the high-risk patients who may experience postoperative nausea and vomiting (POVV), preoperative anesthetic evaluation and optimization will be required.

The enema was only administered early in the morning on the day of surgery, although all patients will be admitted without mechanical colonic preparation. Up to two hours prior to surgery, fluids high in carbohydrates will be used to optimize the nutritional condition. The scheduled fasting hours are two hours for fluids and six hours for solid food. All patients will get 40 mg of subcutaneous heparin and a prophylactic dosage of antibiotics. We were required to wear elastic stockings.

Conduction of anesthetic and analgesia following patient monitoring, IV-line security, fluid initiation, and antiemetic medication administration in accordance with established patient risks are all examples of intraoperative measures. This group of patients will be given a combination of epidural and general anesthesia. Depending on the location of the intended surgical incision, an epidural puncture and catheterization will be carried out in one of the intervertebral spaces between T7 and T10; the infusion will then be maintained using 0.1% bupivacaine and 2–5 mic/mL of fentanyl. Then, just like in group A, general anesthesia will be induced and maintained. Depending on the patient's needs, acetaminophen and/or NSAIDs will be used in place of narcotics. Throughout the whole surgical operation, the intraoperative temperature will be tracked and maintained.

A high-risk patient must receive IV dexamethasone during induction and ondansetron at the conclusion of operation to prevent the onset of PONV. We will not employ a nasogastric tube or intraperitoneal drains. Patient-controlled epidural analgesia will be used to control postoperative pain. Using 250 mL of 0.1% bupivacaine and 2 μg/mL of fentanyl, it will be set up to be administered as a 2 mL bolus with a background infusion rate of 4 mL/h and a lockout interval of 20 minutes.

Using dexamethasone and antiemetic medications, PONV were closely monitored and vigorously treated. As soon as the intestinal noises can be heard, postoperative oral intake will begin. Clear fluids will be allowed, followed by a full

liquid diet on the 1st postoperative day and a regular diet on the 2nd day, if tolerated. It is recommended that early ambulation be improved for four hours on the first postoperative day, six hours on the second, and eight hours on the days that follow.

A visual analogue scale (VAS) will be used to assess postoperative pain for all patients in both groups. Additionally, early postoperative complications such as postoperative nausea and vomiting (PONV), ileus, intestinal obstruction, wound infection, abdominal dehiscence, anastomotic leakage, intraperitoneal abscess, or peritonitis will be assessed. Additionally, non-surgical postoperative problems such as electrolyte imbalance and cardiac issues will be tracked and documented. Within 30 days following surgery, an estimate of the length of stay in the hospital.

Outcomes

The primary outcome is successful SURGERY for left sided colonic cancer with minimal postoperative complications

The 2 ry outcome decreases overall cost throughout enhancement of early recovery and decreases hospital stay

Ethical Approval: This study was ethically approved by the Institutional Review Board of the Faculty of Medicine, Benha University. Written informed consent was obtained from all participants. This study was executed according to the code of ethics of the World Medical Association (Declaration of Helsinki) for studies on humans.

MS: 34 - 1- 2024

Statistical analysis

The student "t" test was used for statistical analysis of quantitative parameters that were described using range (minimum and maximum) and mean and standard deviation. The chi-square test was used for qualitative data that were presented as frequency with percentage. The Statistical Package for Social Sciences (SPSS-20) version 21 was used. Less than 0.05 probability values were regarded as significant. (SPSS Inc., Chicago, Illinois, USA)

Results:

62 individuals with left-side colon cancer who had elective colectomy were included in the current study. In terms of demographic information, social behaviors, and preoperative comorbidities, namely, ischemic heart disease (IHD), hypertension (HT), diabetes mellitus, and prior history of deep vein thrombosis (DVT)—the randomized patients into the two assigned groups did not exhibit statistically significant differences. Table 1.

All patients in groups A and B had hand-sewn anastomoses to restore gut integrity following colonic resection. Group A's mean operative time was 171.9 ± 12.4 minutes, while group B's was 152.2 ± 17.1 minutes. This was statistically significant (P = 0.038) Table 2.

Patients in group B reported significantly less discomfort than those in group A (P = 0.016*), as indicated in Table 2. Except for PONV , which were significantly lower in group B. There was no statistically significant difference between the two groups in terms of postoperative surgical and non-surgical problems.

The length of the hospital stays, including readmission days, was computed from the day of admission to the day of discharge. Group B's hospital stay was noticeably shorter than Group A's, as indicated in Table 2, and there was no difference in the two groups' readmission rates. Although group B's mean number of readmission days was marginally higher than group A's, there was still no discernible statistical difference.

Table 1: Sociodemographic data and comorbidities

Patients		**Group A (*n* = 31)**	**Group B ERP (*n* = 31)**	***P value***
Sex				
Males	N(%)	17	16	0.086
Females		14	15	
Age	Median (min-max)	47 (39–64)	49 (37–71)	0.83
	Mean ± SD	44.6 ± 7.2	45.1 ± 6.8	
BMI (kg/m^2)	Median (min-max)	30 (23–38)	31 (25–41)	0.47
	Mean ± SD	28.7 ± 4.6	27.8 ±5.6	
Comorbidities				
Smoking	N(%)	11(35.5%)	13 (41.9%)	0.062
IHD	N(%)	4 (12.9%)	3 (9.7%)	0.09
HTN	N(%)	8 (25.8%)	6 (19.35%)	0.078
DM	N(%)	7 (22.6%)	8 (25.8%)	0.11
DVT	N(%)	1(3.22%)	1(3.22%)	1.00

Table 2: Hospital stay and readmission, Postoperative outcomes.

Patients		**Group A (*n* = 31)**	**Group B ERP (*n* = 31)**	***P value***
Operative time in min	**Range**	139 - 209	129 - 194	0.038
	mean±SD	171.9 ± 12.4	152.2 ± 17.1	
Hospital stay	Median (min-max)	8 (6–15)	4 (3–8)	< 0.001*
	Mean ± SD	7.2 ±1.1	4.2 ± 0.9	
Readmission in days				
	N(%)	28 (90.3%)	28 (90.3%)	1.00
Yes		3 (9.7%)	3 (9.7%)	
No				
Period (in days)	Median (min-max)	5(4-7)	6(4-8)	0.071
	Mean ± SD	4.6±1.1	4.8 ±1	
Pain (VAS) scale	Median (min-max)	4.5 (3–6)	3 (2–5)	0.016*
	Mean ± SD	4.4 ± 0.9	3 ± 1.1	
Post operative complications				
PONV	N(%)	11(35.5%)	6 (19.35%)	0.023*
Ileus	N(%)	5 (16.12%)	4 (12.9%)	0.082
Anastomotic leak	N(%)	2 (6.45%)	2 (6.45%)	1.00
Wound infection	N(%)	3 (9.7%)	2 (6.45%)	0.34
Abdominal dehiscence	N(%)	2 (6.45%)	2 (6.45%)	1.00
Bowel obstruction	N(%)	2 (6.45%)	2 (6.45%)	1.00
Intra-abdominal abscess/peritonitis	N(%)	1(3.22%)	1(3.22%)	1.00
Cardiopulmonary compications	N(%)	4 (12.9%)	3 (9.7%)	0.08
Electrolyte imbalance	N(%)	1(3.22%)	1(3.22%)	1.00

Discussion

It is not always straightforward to implement novel disease management regimens, particularly in the surgical area. Anxiety over higher complications and readmission rates, particularly in cases of shorter hospital stays, is the typical response [21]. In 1999, the ERP idea was introduced by implementing a series of standardized perioperative procedures and practices that embraced joint surgical and anesthetic efforts [22]. The primary goal

was to optimize the patient's perioperative experience by lowering the patient's physical and mental stress, as well as the length of hospital stay and overall expenses [23].

Many surgical specialties, including orthopedics [24], gynecology [25], and many general surgery specialties [26], have enhanced recovery programs. These protocols are highly necessary for colorectal surgery because of the higher hospital stay rates (up to 8 days), the higher incidence of SSI (up to 20%), PONV (up to 80%), and readmission rates (up to 35%) that are associated with this procedure [1].

In several cases, laparoscopy is a crucial component of ERP [27,28]. The short-term results following colorectal surgery have improved when ERP is combined with less invasive techniques [29,30]. However, it has been shown that a favorable outcome and a significantly lower risk of conversions are independent of the laparoscopic surgeon's experience [31]. To remove bias, we favored using the open approach due to non-standardized laparoscopic learning curves.

Age and sex did not affect the postoperative result, and the sociodemographic data between the two groups under investigation did not differ statistically significantly. These findings contradicted those of other authors [32], who reported a notable difference in postoperative outcomes between males and females, particularly in older age groups. Our findings, however, are consistent with another study [33] which reported no evidence of a relationship between sex and postoperative problems.

One of the primary elements of ERP is thoracic epidural analgesia. But in certain studies [34, 35], the authors used thoracic epidural analgesia to delay hospital release since they thought it would cause hypotension and delayed ambulation with a higher risk of UTIs. Although the ERP components were not examined independently in this study, the use of epidural analgesia did not result in a delay in hospital release. Group B's hospital stay was noticeably shorter than group A's.

Another study [1] indicated that the average length of hospitalization following the use of an ERP that included epidural analgesia was like our findings. Our justification for advocating for the use of epidural analgesia is not limited to its intraoperative benefits; it also plays a significant role in improving the postoperative course by reducing the intensity of pain. This was clearly demonstrated in the current investigation, as patients in Group B reported significantly less pain than those in Group A. All patients value pain management, and it will also improve early ambulation, which will lead to fewer pulmonary and vascular problems.

These issues can effectively postpone the discharge of patients who have had less than a smooth recovery after surgery.

Because of the significant reduction in postoperative discomfort and complications compared to patients receiving conventional analgesia, some authors [36] concluded that thoracic epidural analgesia is advised for open colorectal surgery.

Postoperative ileus and distension remain the most frequent and anticipated outcomes following abdominal surgery, despite significant advancements in surgical procedures and perioperative care [37].

In the traditional approach of "resting the bowel until it wakes up," drains, NGT insertion, and enteral restriction have been utilized to protect the patient against aspiration pneumonia, leak, and wound dehiscence. It has been demonstrated, therefore, that neither protecting the anastomotic system nor enhancing the faster resumption of bowel function will reduce the incidence of anastomotic leaks [38, 39].

According to recent research, the small bowel regains its motility 4–8 hours after surgery. Up to 90% of patients have been demonstrated to successfully accept early oral feeding within 24 hours postoperatively, and as early as 2 hours postoperatively, as observed in ERP

following colorectal surgery [40]. These results closely align with our findings of a significant decrease in PONV.

Both groups' mean readmission rates in the current study were 12.5%. This is consistent with findings from other studies [41, 42], which showed that after 30 days following discharge, the rates were 11.4% and 13.7%, respectively. Most organizations view hospital readmission as a quality indicator that provides an objective representation of the frequency and severity of postoperative problems. As a result, ERP did not increase the patients in this group's burden of complications in the current trial.

Conclusion:

When compared to standard care, ERP are safe, dependable, easy to use, and applicable in open left side cancer colon surgery with no detrimental effects on postoperative problems.

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