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Feasibility and Outcome of Enhanced Recovery Programs in Laparoscopic versus Open Elective Colectomy for Left Side Colonic Carcinoma Surgery

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ABSTRACT

Background: Enhanced recovery programs (ERP) have emerged to enhance surgical outcomes and decrease expenses. However, these are still opposed by the traditional measures in the treatment of colorectal carcinoma

Objectives: This study aimed to compare laparoscopic versus open left-side cancer colon resection under the guidelines of ERP.

Subjects and methods: sixty-two patients with left side cancer colon were divided into two equal groups: group (A) received laparoscopic colectomy (LC) and group (B) received open colectomy (OC). ERP were applied. Follow-up was planned for 1 month for the early outcomes.

Results: the mean age of the included subjects was 49.2 ± 6.23 and 47.8 ± 6.9 years in LC and OC groups respectively. There was a significantly less hospital stay in LC group when compared with OC group (P=0.001). Significantly more pain was reported in OC Group (P=0.001%). There was a significant difference regarding postoperative complications where Postoperative nausea and vomiting (PONV), ileus, wound infection and wound dehiscence were statistically higher in OC group when compared with patients who received LC (P=0.001).

Conclusion: Laparoscopic left-sided colectomy, when establishing ERP, is safer, more dependable, easier to use, and more appropriate than open left-sided colon cancer surgery—especially when performed by skilled surgeons with fewer postoperative problems and shorter hospital stays.

Keywords: Colon cancer. ERP. Laparoscopic colectomy.

INTRODUCTION

Historically, colorectal surgery has been linked to high postoperative hospital expenses, lengthy hospital stays, and incidence of surgical site infections (SSIs) that are close to 20% [1,2]. Furthermore, readmission rates might reach 35%. perioperative nausea and vomiting (PONV) incidence rates can reach 80% [3].

Patients undergoing elective surgery are administered enhanced recovery protocols (ERP). Although these protocols are generally not meant for nonelective cases, emergent/urgent patients could definitely benefit from some of the ERPs' components [4].

ERPs—also referred to as "fast track" protocols—are intended to enhance patient outcomes [5]. ERP main aims are decreased incidence of surgical infections, decrease hospital stay as well as early regain of bowel motility [6]. Despite the fact that there are several perioperative procedures available. ERPs application is targeted towards lowering length of stay and morbidities [7,8].

ERPs were assessed for overall complication rates and length of stay (LOS) in comparison with traditional perioperative standards, according to a 2011 Cochrane analysis [9]. Further studies linked ERPs to lower overall expenses, higher patient satisfaction [2,8,10,11]. ERPs are also linked to better results, independent of the type of surgery. Furthermore, a number of studies have demonstrated the safety and effectiveness of ERPs in older patient populations[12].

Research indicates that the implementation and maintenance of ERPs should not be done dogmatically, but rather call for continuous quality improvement and ongoing compliance evaluation [13]. A typical ERP consists of a wide range of preoperative, intraoperative, and postoperative components, making it challenging to determine which are most helpful within the "bundle" of concurrently implemented measures. The data pertaining to the various ERP components for colorectal surgery is assessed in this clinical practice recommendation [14].

Minimal invasive surgery if available has become a cornerstone in ERP. And this has motivated the authors to conduct the present study to report the outcome of ERP in laparoscopic versus open elective colectomy for left side colonic carcinoma surgery

PATIENTS AND METHODS

Study design

The current retrospective study was conducted throughout the period from May 2020 till April 2024 at the Surgery Department, Benha University. 64 patients were included with left-sided cancer colon eligible for elective colectomy with colo-colic or colorectal anastomosis. Advanced, perforated, or obstructed tumors were excluded. Patients with bleeding tendency or

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contraindications to regional anesthesia as well as those who were not candidates for laparoscopic colectomy were also excluded.

Patients were enrolled taking into consideration 1:1 ratio into 2 groups

Group A underwent laparoscopic colectomy (LC) while Group B underwent open colectomy (OC).

For all patients, complete history taking, examination, colonoscopy and CT metastatic work up was done.

Procedure

The standard protocol for enhanced recovery programs (ERP) was followed in accordance with the recent guidelines for colonic surgery [15].

Assessment and optimization of preoperative anesthetic was required, along with accurate determining the high-risk patients who might experience PONV. The enema was only administered in the early hours on the day of surgery, even though all patients were admitted without undergoing mechanical colonic preparation. Up to two hours prior to operation, the nutritional status was maximized by consuming fluids high in carbohydrates. It was intended that solid meals would be fasted for six hours and water for two hours. Each patient received 40 mg of subcutaneous heparin 2 hours before the surgery and a prophylactic dose of antibiotics one hour before induction. Elastic stockings had to be worn.

Intraoperative interventions included initiating fluids, establishing IV lines, administering antiemetic medications based on specified patient risks, and conducting anesthesia and analgesia following patient monitoring. This group of patients underwent combination epidural and general anesthesia. In accordance with the location of the intended surgical incision, an epidural catheterization was carried out between T7 and T10 intervertebral spaces. The infusion was then maintained with 0.125% bupivacaine and 2-4 micrograms/mL of fentanyl. The same as in group A, general anesthesia was then produced and maintained.

Depending on the patient's needs, acetaminophen and/or NSAIDs were used in place of less frequent usage of opioids. Throughout the entire surgical operation, the intraoperative temperature was kept track of and regulated, which also helped establish how much fluid needed to be given to keep the patient euvolemic. A high-risk patient required intravenous induction of dexamethasone and postoperative ondansetron administration to prevent the onset of (PONV). No nasogastric tube or intraperitoneal drains were employed.

Patient-controlled epidural analgesia was used to control postoperative pain. The setup involved 250 mL of 0.125% bupivacaine and 2 µg/mL of fentanyl, which was prepared to be administered as a 2 mL bolus with a 20-minute lockout period and a 4 mL/h background infusion. Dexamethasone and antiemetic medications were used to aggressively treat and monitor postoperative nausea and vomiting. As soon as the intestinal noises could be heard, postoperative oral intake began. Clear fluids were then allowed, followed by a liquid diet on the 1st postoperative day and a regular diet on the 2nd day as tolerated. It was recommended to increase early ambulation for four hours on the 1st day, six hours on the 2nd, and eight hours on the days that followed.

Visual analogue scale (VAS) was used to assess postoperative pain in both groups of patients. Early postoperative sequelae included wound infection, intestinal obstruction, PONV, ileus, leakage, and peritonitis. Additionally, electrolyte imbalance and cardiac complications—which are non-surgical postoperative complications—were tracked and documented. Within 30 days following surgery, the LOS and the quantity of readmissions were estimated.

Ethical Approval:

This study was ethically approved by the Institutional Review Board of the Faculty of Medicine, Benha University. Written informed consents were 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.

Statistical analysis

Quantitative parameters were reported using mean and standard deviation and were compared using the Mann-Whitney test. For qualitative factors that were expressed as the frequency with percent, the chi-square test was employed. SPSS-21 was employed for statistical analysis. Less than 0.05 as the probability value was deemed significant.

RESULTS

The present study included 62 patients with a mean age of 49.2 ± 6.23 and 47.8 ± 6.9 years in LC and OC groups respectively. No significant differences were found regarding demographic data, or preoperative comorbidities as shown in **table (1).**

Table 1: Sociodemographic data

Variables		Group A (LC) N=32	Group B (OC) N=32	P value
Age	Mean ± SD	49.2 ± 6.23	47.8 ± 6.9	0.398
Sex Males Females	N (%)	21(65.6%) 11(34.4%)	19(59.4%) 13(40.6%)	0.606
BMI	Mean ± SD	29.2 ± 3.22	28.1± 3.87	0.221
Smoking	N (%)	5(15.6%)	4(12.5%)	0.719
Comorbidities				
Ischemic heart disease (IHD)	N (%)	2(6.25%)	2(6.25%)	1.00
Hypertension	N (%)	5(15.6%)	4(12.5%)	0.089
Diabetes Mellitus (DM)	N (%)	4(12.5%)	4(12.5%)	1.00

The mean operative time of LC group was slightly longer but with no statistically significant difference in comparison with that of OC group, with a significantly less hospital stay in LC group in comparison with OC group. There was a statistically significant earlier return of bowel movement. OC group experienced significantly more pain than LC group. There was a significant difference regarding postoperative complications where PONV, ileus, wound infection and wound dehiscence were higher OC group in comparison with LC group **(Table 2).**

Table 2: Operative time, hospital stay and postoperative complications

Variables		Group A (LC) N=32	Group B (OC) N=32	P value
Operative time (min)	Mean ± SD	159.2±23.1	155.2±15.1	0.415
Hospital stay (days)	Mean ± SD	3.6±1.2	5.4±1.5	0.001*
VAS score	Mean ± SD	2.3±0.67	3.1±1.2	0.001*
complications				
Cardiovascular complications	N (%)	3(9.4%)	4(12.5%)	0.689
Electrolyte imbalance	N (%)	3(9.4%)	3(9.4%)	1.00
PONV	N (%)	4(12.5%)	6(18.75%)	0.491
Ileus	N (%)	3(9.4%)	6(18.75%)	0.281
Anastomotic leak	N (%)	2(6.25%)	2(6.25%)	1.00
Wound infection	N (%)	1(3.6%)	4(12.5%)	0.01*
Wound dehiscence	N (%)	1(3.6%)	4(12.5%)	0.01*
Intraperitoneal abscess or peritonitis	N (%)	1(3.6%)	1(3.6%)	1.00

*: Significant

DISCUSSION

In the surgical field, implementing new regimens for overall illness care is a challenging undertaking. Anxiety over higher complications and readmission rates is the typical response, particularly in cases of shorter hospital stays [15]. In 1999, **Kehlet** [16] introduced the notion of ERP by utilizing standardized perioperative methods and procedures that incorporated cooperative surgical and aesthetic endeavors.

The primary goal was to optimize the patient's perioperative care by lowering physiological and psychological stress, shortening hospital stays, and lowering overall costs [17]. Many surgical disciplines, including orthopedics, gynecology, and various subspecialties of general surgery have implemented enhanced recuperation programs [15]. Given the higher rates of hospital stays following colorectal surgery, which can last up to eight days, as well as the associated higher incidence of surgical site infections, which can last up to 20%—PONV, which can last up to 80% and readmission rates, which can reach up to 35%—it is imperative that these protocols be followed [18].

Laparoscopy is a cornerstone of ERP as reported by many researchers [19,20]. Minimally invasive techniques together with ERP usually improve the short-term outcome [21]. The laparoscopic surgeon experience is an independent factor in a successful procedure and a significantly lower rate of conversions [22].

One of the most contentious issues in the literature was mechanical bowel preparation (MBP). Studies have shown that MBP alone does not significantly improve anastomotic leak or related complications in elective left-sided colectomy procedures, and a 2011 Cochrane review of RCTs supported this claim [23]. In the meantime, a

meta-analysis including 1769 patients comparing MBP plus oral antibiotics to MBP alone revealed no difference in the rate of organ/space infection following elective colorectal surgery, but there was a decrease in overall SSI (7.2% versus 16.0%). So, before an elective colon resection, MBP and oral antibiotics are strongly advised by the most recent guidelines, which were released in 2023 [1].

Irani *et al*. [1] described in the most recent guidelines in colorectal surgery that laparoscopy should be used when the expertise is available.

RCTs and big database studies provide high-quality evidence in favor of laparoscopy in colorectal surgery. Laparoscopy was found to be superior than open resection in two different multicenter RCTs from Australia and the Netherlands in terms recovery of bowel function, blood loss, pain, and LOS [24]. Comparing laparoscopic colonic resection to open resection, a number of other RCTs reported decrease overall morbidity, surgical and nonsurgical morbidity [25]. Additional randomized controlled trials demonstrated that patients undergoing laparoscopy had shorter recovery times from their surgeries, used fewer opioids [26]. These outcomes are in line with extensive database studies that supported the use of laparoscopy [27]. Prominent Cochrane reviews have assessed both immediate and long-term results, endorsing the laparoscopic method for colon surgery [28].

Interestingly, the methodological quality of a large number of the included studies ranged from moderate to poor. As evidenced by a major 4-limb clinical research that randomly allocated 427 patients to OC versus LC with an ERP against a conventional treatment pathway reporting that LC with an ERP is associated with best outcomes. In this study, individuals who underwent open surgery or laparoscopy inside a typical care pathway did not have as good of results as those who underwent laparoscopic surgery within an ERP [29]. Therefore, when it makes sense, a minimally invasive technique is advised to maximize postoperative healing inside an ERP. This comes with the results of the current study where there was a statistically significant earlier return of bowel movement as well as less reported postoperative pain

ERP includes thoracic epidural analgesia (TEA) as one of its primary components. Nonetheless, in certain research, such as those by **Liu *et al.*** [30] and **Halabi *et al*.** [31] recorded a postponement of hospital release through the use of TEA, as they deduced that this could result in hypotension, delayed ambulation, and an increased risk of UTIs. While the ERP items were not examined individually in this trial, the use of epidural analgesia did not improve hospital discharge outcomes. Compared to patients who had an open colectomy, those who had a laparoscopic colectomy experienced a far shorter hospital stay. The LOS following the use of an ERP with epidural analgesia, as demonstrated by **Thiele *et al.*** [2] was similar to our findings.

We defend the use of epidural analgesia by pointing out that while its advantages cannot be used during surgery, it plays a significant role in enhancing the postoperative course and lowering priority. All patients value pain alleviation in and of itself, and it will undoubtedly improve early ambulation and reduce pulmonary and vascular problems as a result. This goes against the findings of **Carmichael *et al*.** [32], who came to the conclusion that, given the observed considerable decrease in postoperative discomfort and problems compared to those subjected to conventional analgesia, TEA is suggested for OC but not for routine use in LC.

Postoperative ileus remains the most frequent and anticipated outcomes following abdominal surgery, despite significant advancements in perioperative care and surgical procedures [15]. A statistically significant distention and ileus occurred in patients who underwent open colectomy. In a custom known as "resting the bowel until it wakes up". Intraperitoneal drains, nasogastric tube insertion, and enteral restriction have historically been utilized to protect patients against leak, and wound dehiscence. It has been established, therefore, that neither the protection of the anastomosis nor the enhancement of an earlier return of bowel function would result in a lower frequency of anastomotic leakage [33].

According to previous research, the small bowel recovers its motility 4–8 hours after surgery. As demonstrated in ERP following colorectal surgery, early oral feeding is tolerated by up to 90% of patients in the 1st day postoperatively and as early as 2 hours after surgery [34]. These results are in line with our findings, which show a considerable decrease in PONV.

Most organizations view hospital readmission as a quality measure that provides an objective representation of the frequency and seriousness of postoperative problems [15].

CONCLUSION

Laparoscopic left-sided colectomy, when establishing ERP, is safer, more dependable, easier to use, and more appropriate than open left-sided colon cancer surgery—especially when performed by skilled surgeons with fewer postoperative problems and shorter hospital stays.

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