Comparative Study Between Enhanced Recovery After Surgery and Conventional Perioperative Care in Elective Colorectal Surgery

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Abstract
Objective: A joint research between departments of general surgery and anesthesiology, aims to examine the feasibility and safety of enhanced recovery after surgery (ERAS) in elective colorectal surgery.

Patients & Methods: The study included 80 patients candidates for abdominal colorectal surgery, randomly divided into two groups; group C contains 40 patients managed perioperatively through conventional management procedures and group E contains 40 patients managed according to ERAS protocols. Patients in both groups were monitored throughout the perioperative period. Collected data includes compliance data, operative data, PO complications, bowel recovery as well as the length of ICU and hospital stay.

Results: The overall compliance rates with the ERAS protocols was 80 %. No significant difference between both groups concerning operative time. Pain scores were significantly low (p-value <0.001) between patients of ERAS group compared to the other group. First flatus occurred at the 1st PO day in both groups with a significant difference in a number of cases (p-value <0001) among both groups. Median PO length of stay was significantly different (p-value<0.001) between both groups.

Conclusion: ERAS pathway feasible for application in colorectal surgery as it shortened the PO hospital stay and showed no risk to patients in terms of morbidity or mortality.

Keywords: Enhanced Recovery after Surgery pathway, ERAS. Colorectal surgery and perioperative.
Introduction

Significant improvements in outcomes subsequent to abdominal major operations can be accomplished by implementing a consistent protocol on evidence-based medicine in all perioperative steps (1). This method has merged into enhanced recovery after surgery (ERAS) pathway or "fast track surgery" which have progressed into a wider model named the perioperative surgical home (2). Over the last decade, ERAS programs have produced a real revolution in the management of colorectal surgery, vascular surgery and thoracic surgery patients. Initially introduced by Henrik Kehlet from Denmark, in the early 1990s (3). ERAS is a multidisciplinary set of a pathway that targets to diminish the stress response to surgery and improves PO outcome by controlling perioperative management process. The main aim of all perioperative programs is to decrease hospital stay and to speedily regain the complete well-being of the patient without increasing the rate of complications (4).

Concentrating on colorectal surgery, now a strong evidence indicating that, there is a well-documented association between ERAS and improved PO short-term outcomes, comprising decline in length of hospital stay, decrease in morbidity, quicker resume of bowel function, faster ambulation, and lower pain scores (5), (6). In spite of all great benefits of ERAS, there are major limitations in employing such protocols, this may be attributed to the difficulties in patients’ acceptance of all interventions within the program (7). There is a wide acceptance to ERAS in western countries and the USA, while in the developing countries, ERAS programs still facing considerable challenges for application (8). There are restricted number of studies recording successful application of ERAS in Egypt. ERAS protocol, a promising approach that we attempt to achieve it among patients submitted to abdominal colorectal surgery at our university hospital.
Patients and methods

The present prospective study was conducted at General Surgery Department, Benha university hospital, King Saud hospital in Onizah at Kingdom of Saudi Arabia (KSA) and Al-Adwani General Hospital, Taif, KSA, since October 2013 till October 2016. After approval of the study protocol by the Local Ethical Committee and obtaining written fully informed patients’ or nearest relative consent, the study included 80 patients presenting with a colorectal problem candidate for abdominal colorectal surgery. Prior to the patient including in the present study, each participant had a comprehensive discussion about the nature of the ERAS and details of the pre-, intra-, and PO items of the care plan. When the patients were randomized, an extra consent was taken for the surgical procedure. The patients were assessed by a multidisciplinary team including participants from colorectal surgery, gastrointestinal surgery, Anesthesiology, Nutritional Services and Nursing staff.

Inclusion criteria include: (1) patients presenting with a colorectal problem candidate for abdominal colorectal surgery for the malignant or benign disease. (2) Age between 18-70 years. (3) the American Society of Anesthesiologists (ASA) grade I, II or III. (4) Patients who are able to understand and follow the necessities of the program and to offer a consent. (1) Having some social criteria for early discharge for example a home sited within 1 hour from the hospital.

Exclusion criteria: (1) Emergency colorectal surgery. (2) Abdominal surgery requiring resection of more than one organ. (3) ASA grade IV. (4) The need for inpatient PO rehabilitation. (5) Age less than 18 or more than 70 years. (6) Low socioeconomic status.

Patients were randomly distributed into two equal groups according to the assigned management technique using sealed envelopes: Group C included patients assigned for Conventional recovery pathway and group E included patients assigned for ERAS protocols.

A- Preoperative Preparation for ERAS pathway group:

- All staff and nurses dealing with patients, were educated about ERAS care strategy.
- In the preoperative anesthesia visit, patients were informed broadly about our ERAS protocols and the objective of early PO discharge.
- Preoperative preparation procedure did not comprise mechanical bowel preparation. However, in patients undergoing left colonic and rectal resection, an evacuating fleet enema (120 mL) done the night prior to and the morning of surgery for the safety of colorectal anastomosis.
- Patients received 200 ml of carbohydrate-rich drinks four times a day earlier to surgery and two doses on the morning of the operation.
- Patients kept fasting before the operation: 2 hours for liquids and 6 hours for solids.
- Prophylactic IV antibiotic (metronidazole 500 mg and ceftriaxone 1 g) was given one hour before surgery and sustained for 24 hours subsequently (2 extra doses).
- Prophylactic therapy against thromboembolism: SC enoxaparin 40 mg given 12 h prior to insertion of epidural catheter and sustained as 40 mg once daily until discharge.
- The continuation of medicines the patient is already taking.
- Starting at midnight before surgery, patients did not take any medications recognized to cause long-term sedation. Short-acting drugs only allowed to aid in insertion of epidural catheter.
B- Intraoperative adherence to ERAS pathway:

I. Standard anesthesia protocol:

- Propofol (Diprivan), used for IV induction due to its short time of action with a minimal side-effect. Highly volatile agents like sevoflurane or isoflurane used for Maintenance.
- After induction of anesthesia, a urinary catheter and an NGT were inserted in all patients.
- Ketorolac IV (1 mg / kg) and dipyronesodium (20 mg / kg) were given in a loading dose if not contraindicated to offer a multimodal analgesic regimen.
- A local anesthetic (lidocaine 2 % without epinephrine) was given (unless contraindicated) in the epidural catheter which inserted preoperatively.
- Low-dose fentanyl (0.5–1 µg / kg) was given intraoperatively through the epidural catheter to offer suitable PO analgesia.
- Intraoperative maintenance of normothermia
- Anti-emetic prophylaxis: After induction of anesthesia, Single dose of IV dexamethasone 8 mg and ondansetron (Zofran) 8 mg were given.
- Perioperative fluid administration: 500 mL of colloid was given regularly prior to epidural running of local anesthetics. Intra-operatively, IV lactated Ringer’s was given 4 ml/kg / hour. Lost Blood was replaced 1:1 with colloids.
- Packed RBCs was given depending on the target hematocrit (Hct) that was determined along with age and absence or presence of cardiomyopathy. Target Hct was 26, if neither of these was present (cardiomyopathy or patient’s age > 65), 28 If there was cardiomyopathy or patient’s age >65, and 30 if there was cardiomyopathy and patient’s age >65.

II. Standard Surgical technique

- All patients underwent abdominal colorectal surgery. The laparoscopic approach considered as the first choice surgical technique and if not possible, conventional laparotomy was done with smallest incision and transverse incisions was preferred.
- To minimize PO pain, wounds were infiltrated with a local anesthetic agent prior to closure.
- No regular placement of intra-abdominal drainage.
- The NGT was removed inside the operating theater at the time of extubation.

C- Postoperative items for ERAS pathway

- Immediate PO monitoring was completed in the post-anesthesia care unit (PACU). Subsequent to full recovery, patients were shifted to ordinary ward.
- Postoperative analgesia: In PACU patients received a continuous epidural low-dose local anesthetic (0.125 % bupivacaine) as well as a low-dose opioid (2 mg / mL of the analgesic solution). Ketorolac 1 mg/kg was given TID till patients were able to tolerate enteral feeding, then oral analgesia was provided.
- Along PO period, patient-controlled analgesia pumps were not used.
- Metoclopramide hydrochloride was received if nausea or vomiting really occurred.
- Early ambulation: Patients were managed in a situation that encouraged independence and quick mobilization. Patients were strongly enforced to be out of bed on the day of surgery. Then mobilized not less than 2 hours throughout the 1st POD.
- Immediate PO cessation of IV fluids; 6 hours PO, patients restarted a liquid diet. 12 hours PO patients were allowed to eat the semisolid meal sitting at the table.
- On POD1: Patients were reassessed and the care plan was discussed again. Urinary catheter was removed (except in patients who underwent low anterior rectal resection or APR, in whom it was removed on the POD2).
o On POD2: Ordinary hospital meals were allowed. Removal of the epidural catheter.
o On POD3: Assessment of patient status and discharge was approved according to discharge criteria which are: patient should be alert and oriented, no fever, no tachycardia, tolerance of oral feeding, pain control with oral analgesia, mobilized independently and suitable care at home. (Passage of flatus or stool not considered at the time of discharge)
o Post-discharge care: At the time of discharge, patients of the ERAS group were instructed how to contact the hospital when needed as well as they received a phone call by the anesthetist one-day post discharge.

Perioperative management of group C patients was done according to conventional hospital management protocols.
Patients of both groups attended a follow-up outpatient visit on the 7th PO day and one month later.

**Statistical analysis**

Obtained data were presented as mean ± SD, ranges, numbers and ratios. Results were analyzed using Wilcoxon; ranked test for unrelated data (Z-test) and Chi-square test (X² test). Statistical analysis was conducted using the SPSS (Version 15, 2006) for Windows statistical package. P value <0.05 was considered statistically significant.
Results

The present study included 80 patients, candidates for elective abdominal colorectal surgery. They divided randomly into 2 groups according to the perioperative protocols offered to them. Group C (control group), included 40 patients (50%) assigned for Conventional recovery pathway and group E included 40 patients (50%) assigned for ERAS pathway. There was non-significant (p>0.05) difference between both study groups regarding demographic and general clinical data as shown in table (1).

Patients of both groups passed the procedure efficiently without any intraoperative complications. All operative and postoperative data mentioned in details in table (2). The mean operative time was 160±5.4 minutes in ERAS group and 155±9.6 minute in control group, this did not reach statistical significance (P-value > 0.05).

Guidelines of the ERAS pathway were followed closely in our study with an overall compliance (adherence) rate 80%. The details of perioperative adherence to protocols are showed in Table (3). Postoperative outcomes among patients who were managed through the ERAS pathway showed a significant difference (p-value < 0.001) in the total and PO hospital stay in comparison with patients who were managed through conventional perioperative technique (Fig. 1). Postoperative Patient self-stated pain scores revealed a significant (p-value <0.001) lower median pain scores among patients managed through ERAS compared to controlled group (Fig. 2).

Patients in the ERAS group had a shorter time to first flatus (55% vs 20% in the first post-operative day) and a shorter time to resumption of normal diet, (P-value < 0.001) which is statistically significant. The incidence of postoperative complications was lower in the ERAS group (10% vs 12.5%). As regard readmission and reoperation there was no any significant difference between both groups (P-value > 0.05). There was no mortality during the follow up period in both groups.

Details of PO outcomes of ERAS group versus controlled group mentioned clearly in table (4), (Fig. 3).

Table (1): Patients' demographic data (original).

<table>
<thead>
<tr>
<th>Data</th>
<th>Group C</th>
<th>Group E</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number (%)</td>
<td>40 (50%)</td>
<td>40 (50%)</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>58.2±11.1 (41-69)</td>
<td>60.5±10.6 (39-65)</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td>0.464</td>
</tr>
<tr>
<td>Males</td>
<td>27 (67.5%)</td>
<td>24 (60%)</td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>13 (32.5%)</td>
<td>16 (40%)</td>
<td></td>
</tr>
<tr>
<td>BMI (Kg/m²)</td>
<td>25.5 (14.9-36.7)</td>
<td>24.1 (15.8-38.3)</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>Associated co-morbidities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>15 (37.5%)</td>
<td>20 (50%)</td>
<td></td>
</tr>
<tr>
<td>One</td>
<td>14 (35%)</td>
<td>13 (32.5%)</td>
<td></td>
</tr>
<tr>
<td>Two</td>
<td>11 (27.5%)</td>
<td>5 (12.5%)</td>
<td></td>
</tr>
<tr>
<td>Three</td>
<td>0</td>
<td>2 (5%)</td>
<td></td>
</tr>
<tr>
<td>Mean number</td>
<td>1.1±0.6 (1-2)</td>
<td>1.6±0.7 (1-3)</td>
<td>&lt; 0.102</td>
</tr>
<tr>
<td>Type</td>
<td></td>
<td></td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>6 (15%)</td>
<td>8 (20%)</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>5 (12.5%)</td>
<td>6 (15%)</td>
<td></td>
</tr>
<tr>
<td>Hepatic disease</td>
<td>2 (5%)</td>
<td>3 (7.52%)</td>
<td></td>
</tr>
<tr>
<td>Renal troubles</td>
<td>1 (2.5%)</td>
<td>2 (5%)</td>
<td></td>
</tr>
<tr>
<td>CVA</td>
<td>1 (2.5%)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>ASA grade</td>
<td></td>
<td></td>
<td>&lt; 0.003</td>
</tr>
<tr>
<td>ASA grade I</td>
<td>29 (72.5%)</td>
<td>26 (65%)</td>
<td></td>
</tr>
<tr>
<td>ASA grade II</td>
<td>9 (22.5%)</td>
<td>13 (32.5%)</td>
<td></td>
</tr>
<tr>
<td>ASA grade III</td>
<td>2 (5%)</td>
<td>1 (2.5%)</td>
<td></td>
</tr>
<tr>
<td>Indication for surgery</td>
<td></td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>Colorectal carcinoma</td>
<td>25</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Malignant polyp</td>
<td>6</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Diverticular disease</td>
<td>9</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Inflammatory bowel disease</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Data are presented as numbers & mean±SD, percentages & ranges are present in parenthesis.
Table 2: Operative and postoperative data (original).

<table>
<thead>
<tr>
<th>Data</th>
<th>Strata</th>
<th>Group C</th>
<th>Group E</th>
<th>Pvalue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operative time (min)</td>
<td></td>
<td>155±9.6 (110-215)</td>
<td>160±5.4 (100-230)</td>
<td>NS</td>
</tr>
<tr>
<td>Intraoperative bleeding (ml)</td>
<td></td>
<td>175±8.5 (100-550)</td>
<td>175±8.8 (200-450)</td>
<td>NS</td>
</tr>
<tr>
<td>Operative procedure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laparoscopic</td>
<td></td>
<td>13(32.5%)</td>
<td>15(37.5%)</td>
<td>NS</td>
</tr>
<tr>
<td>Laparoscopic converted to open</td>
<td></td>
<td>5(12.5%)</td>
<td>6(15%)</td>
<td></td>
</tr>
<tr>
<td>Open</td>
<td></td>
<td>22(55%)</td>
<td>19(47.5%)</td>
<td>NS</td>
</tr>
<tr>
<td>Operation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right/extended right hemicolectomy</td>
<td></td>
<td>6(15%)</td>
<td>8(20%)</td>
<td>NS</td>
</tr>
<tr>
<td>Sigmoidectomy</td>
<td></td>
<td>9(22.5%)</td>
<td>7(17.5%)</td>
<td></td>
</tr>
<tr>
<td>Hartmann reversal</td>
<td></td>
<td>8(20%)</td>
<td>6(15%)</td>
<td></td>
</tr>
<tr>
<td>Subtotal colectomy</td>
<td></td>
<td>5(12.5%)</td>
<td>4(10%)</td>
<td></td>
</tr>
<tr>
<td>Total colectomy and proctectomy</td>
<td></td>
<td>2(5%)</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Anterior resection</td>
<td></td>
<td>7(17.5%)</td>
<td>10(25%)</td>
<td></td>
</tr>
<tr>
<td>Abdominoperineal excision</td>
<td></td>
<td>3(7.5%)</td>
<td>5(12.5%)</td>
<td></td>
</tr>
<tr>
<td>PO complication</td>
<td></td>
<td>Total events</td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>PO ICU admission (hours)</td>
<td></td>
<td>5</td>
<td>4</td>
<td>NS</td>
</tr>
<tr>
<td>PO ICU admission (days)</td>
<td></td>
<td>21±6.58(0-36)</td>
<td>13±4.39(0-20)</td>
<td></td>
</tr>
</tbody>
</table>

Data are presented as numbers & mean±SD; percentages & ranges are present in parenthesis.

Table 3: Adherence to the rules in ERAS group versus controlled group (original).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Group C</th>
<th>Group E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative patient education and psychotherapy</td>
<td>90 %</td>
<td>100 %</td>
</tr>
<tr>
<td>Preoperative no bowel preparation</td>
<td>30 %</td>
<td>65 %</td>
</tr>
<tr>
<td>Day before surgery: Oral drinks rich in Carbohydrate</td>
<td>0.0</td>
<td>70 %</td>
</tr>
<tr>
<td>Preoperative practice non opioid medications</td>
<td>10 %</td>
<td>90 %</td>
</tr>
<tr>
<td>Preoperative medication for DVT prophylaxis</td>
<td>40 %</td>
<td>90 %</td>
</tr>
<tr>
<td>Preoperative prophylactic antibiotic</td>
<td>75 %</td>
<td>95 %</td>
</tr>
<tr>
<td>Intraoperative practice of Epidural analgesia</td>
<td>25 %</td>
<td>60 %</td>
</tr>
<tr>
<td>Intraoperative practice of Adjunctive Ketamine</td>
<td>30 %</td>
<td>40 %</td>
</tr>
<tr>
<td>Dexamethasone</td>
<td>30 %</td>
<td>55 %</td>
</tr>
<tr>
<td>Avoidance of NGT or intra-abdominal drains</td>
<td>15 %</td>
<td>80 %</td>
</tr>
<tr>
<td>Smallest length of abdominal incision</td>
<td>25 %</td>
<td>75 %</td>
</tr>
<tr>
<td>PO practice of Epidural analgesia</td>
<td>25 %</td>
<td>70 %</td>
</tr>
<tr>
<td>PO Practice non opioid medications</td>
<td>60 %</td>
<td>90 %</td>
</tr>
<tr>
<td>PO Early suspension of IV fluids</td>
<td>0.0</td>
<td>80 %</td>
</tr>
<tr>
<td>PO Early oral intake</td>
<td>0.0</td>
<td>90 %</td>
</tr>
<tr>
<td>PO discontinue of IV fluids</td>
<td>0.0</td>
<td>85 %</td>
</tr>
<tr>
<td>PO need for NGT</td>
<td>90</td>
<td>15</td>
</tr>
<tr>
<td>PO catheter removal by 2nd day</td>
<td>30%</td>
<td>100 %</td>
</tr>
<tr>
<td>PO Patient mobilization</td>
<td>mobilized on POD 0</td>
<td>15 %</td>
</tr>
<tr>
<td></td>
<td>mobilized on POD 1</td>
<td>40 %</td>
</tr>
<tr>
<td></td>
<td>mobilized on POD 2</td>
<td>50 %</td>
</tr>
<tr>
<td>Discharge before resume of normal bowel habit</td>
<td>0.0</td>
<td>60 %</td>
</tr>
</tbody>
</table>

Data are presented as percentages.
Table 4: Postoperative outcomes of ERAS group versus controlled group (original).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Strata</th>
<th>Group C</th>
<th>Group E</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO Hospital stay (days)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-4</td>
<td>0.0</td>
<td>35(87.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-7</td>
<td>6(15%)</td>
<td>5(12.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-10</td>
<td>27(67.5%)</td>
<td>1(2.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;10 days</td>
<td>11(27.5%)</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (days)</td>
<td>8.5±1.52(5-17)</td>
<td>3.8±1.95(3-8)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>PO nausea and vomiting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pain scores:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From 0 (no pain) to 10 (most horrible pain)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>on POD 0</td>
<td>13(32.5%)</td>
<td>4(10%)</td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>on POD 1</td>
<td>5.3(3-8)</td>
<td>3.1(2-6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>on POD 2</td>
<td>4.6(2-7)</td>
<td>2.1(1-4)</td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>on POD 2</td>
<td>2.1(1-4)</td>
<td>1.8(0-3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passage of flatus / faces</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>on POD 0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>on POD 1</td>
<td>8(20%)</td>
<td>21(55%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>on POD 2</td>
<td>17(37.5%)</td>
<td>30(75%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Readmission (within 30 days PO)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reoperation (within 30 days PO)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Due to bleeding</td>
<td>1(2.5%)</td>
<td>1(2.5%)</td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>Due to leakage</td>
<td>2(5%)</td>
<td>1(2.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mortality</td>
<td></td>
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Data are presented as mean±SD & numbers; ranges and percentages are in parenthesis; PO: postoperative.

FIG. 1: THE FREQUENCY OF PO STAY IN STUDIED GROUPS (ORIGINAL).
Fig. 2: The frequency of PO patients' self-reported pain scores (ORIGINAL).

**FIG. 3: THE FREQUENCY OF TIMING OF PO PASSAGE OF FLATUS / FACES IN STUDIED GROUPS (ORIGINAL).**
**Discussion**

Enhanced Recovery After Surgery pathway (fast-track surgery) was described over the last twenty years (9). The intentions of procedure are faster patient ambulation, raped and proper discharge postoperatively and quick return to work (10). This program deals with the patients prior to, during, and after surgery (11). The concurrent use of such guidelines has a synergistic outcome which achieved the desired goals of the program (12). Our ERAS management plan included patient counseling, avoidance of mechanical bowel preparation, no pre-anesthetic medications, suitable anesthesia and pain control, NGT removal with extubation and controlled the volumes of IV fluids to diminish effect of fluid overload. Furthermore, quick ambulation, early enteral feeding and rapid discharge.

All steps in our ERAS program based on scientific evidence. Some deficits in compliance considered as acceptable. Anne et al, mentioned that, when we want to fix such protocols, the objective is to achieve total compliance with all procedures outlined, but it is usually impossible target (13). In our study the overall rate of compliance is 80%, however the rates are widely variable between different parameters and the reasons should be investigated. Jun hua Zhao et al and Charles et al, confirmed that, Patient counseling as an important subject in the patients’ response to surgery and declines patients’ worry before surgery and leads to less analgesia required in the PO period as patients significantly suffering less pain than uninformed patients (14,15). This correlate with our findings as patients of ERAS pathway group significantly (p-value <0.001) experienced less pain than controlled group with a median PO pain score 3.1 versus 5.3 respectively. Santiago et al, found that, bowel preparation raises the risk of PO leakage with a subsequent increase in rates of PO infectious complications (16). In spite of our adherence rates to avoidance of preoperative mechanical bowel preparation in ERAS group was 75% compared to 35% in controlled group, however the PO leakage occurs less among patients of ERAS 2.5% compared to 5% in controlled group. This results parallel to Timothy et al, who reported that, mechanical preoperative bowel preparation had raised the rates of spillage in colorectal surgery patients when compared with those who did receive bowel preparation: 15% versus 9%, respectively (17).

Wisam et al, showed that, most of European and US surgeons, do not remove NGT after surgery, however, there is no proof supporting their opinion since this may be linked with patient discomfort as well as more complications (18,19). We reinforced the opinion of elimination of the NGT at time of extubation with a compliance rate of 80%. This goes with U. O. Gustafsson et al, who proved that, diminished use of NGT may decrease the incidence of PO chest morbidities (20). Early removal of NGT, prompts early enteral feeding within 6hours postoperatively in ERAS pathway group with a compliance rate of 90% compared to delayed 1st oral feeding up to 72 hours among patients of controlled group. Roulin et al, reported that, early oral feeding keeps the absorptive function of the bowel that leads to more collagen at the anastomotic line, positive nitrogen balance, accelerate wound healing as well as lessen PO sepsis (8). This goes with Massimiliano et al, who said that, PO enteral feeding is harmless even with colorectal anastomosis (21). We followed ERAS protocols in avoiding insertion of intra-abdominal drain in 80% of patients. This goes to high extent with Liang L et al, who reported that, drainage can be avoided or restricted to a small period in utmost patients, helping quick mobilization (22). To avoid hazards of fluid overload, we significantly restricted intraoperative IV fluids administration to no more
than 1 L of crystalloids, additional amounts were given as needed, along with patients' hemodynamic status. Our plane is supported by Robert et al, who found that, fluid overload has been linked with cardiac and pulmonary morbidities, diminished oxygen concentration in muscles and postpone regaining of GIT function (23). According to Mingjuan et al, Anesthesia and pain control has a significant impact on PO morbidities and patient global recovery (24). Our ERAS protocol involved the use of epidural anesthesia and non-opioid medications for pain control, with compliance rates of 60% and 90% respectively. This against Smith et al, who omitted the use of epidural catheters since it elevates the risk of urinary retention, delayed ambulation and eventually delaying PO hospital discharge (25). However, our plan was encouraged by Timothy et al, who proved that non-opioid or opioid- reduced analgesia may accelerate recovery (17). Our ERAS included early PO Ambulation with a compliance rate of 100% compared to 50% of controlled group in the 2nd PO day. Quick mobilization is a key for hastening the PO recovery period as it stimulates the return of normal GIT function and guards against thromboembolic complications. Gregg et al, also mentioned that, early ambulation is directly linked to a reduction in hazard of chest complications, DVT as well as protection of motor power (26). Discharge criteria within ERAS group proved that, discharge of patients prior to the resume of bowel function (passage of flatus or stool) does not carry any significant PO hazards. Around 60% of our patients were discharged home before flatus or feces passage and yet no increased morbidities. This correlate with Ahmed et al, who proved that, patients do not suffer more morbidity when discharged home prior to the resume of normal bowel function (27). Recorded rates of PO complications, readmission and reoperation among patients of ERAS group were approximately similar to those reported in our controlled group as well as by other authors in similar randomized controlled trials. Finally, ERAS was associated with a significant decline in mean PO hospital stay which is 3.8±1.95 days in comparison our controlled group 8.5±1.52 days. Cun et al, mentioned that, a newly published multicenter study from Span, comprising data from 50 hospitals, the mean PO stay was 9.36±3.22 days subsequent to colorectal surgery in patients who were managed through conventional perioperative planes (28).

**Conclusion**

Enhanced Recovery after Surgery pathway feasible for application in colorectal surgery as it shortened their PO hospital stay and showed no risk to patients in terms of morbidity or mortality. The question now no longer to be whether the use of ERAS protocols in colorectal surgery or perioperative conventional care is better, but somewhat how to improve the procedure and facilitate its distribution.
References


