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ERAS versus Traditional Protocol in Major Abdominal Surgery: A Retrospective Study and Review of Literature

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Abstract

Introduction: Enhanced recovery after surgery protocol (ERAS) also called fast-track or multimodal pathways done by a multidisciplinary team, starts from the pre-operative consultation of the patient to hospitalization and until the return of the patient to normal daily activity. In the post-operative recovery following major surgery, complications, length of stay, and cost of care are the emerging issues which can be reduced by the implementation of enhanced recovery after surgery protocol.

Aim: The study was designed to compare Enhanced recovery after surgery protocol vs traditional tenets in our institution.

Result: A retrospective comparative study was done between ERAS & non-ERAS groups. In the ERAS group, significantly reduced Length of stay (4.74±0.94, median 5, p<0.0001) and recovery parameters such as tolerance of oral diet on 1st postoperative day (p< 0.001), mobilization on 1st postoperative day (P< 0.0001).

Conclusion: Enhanced recovery after surgery protocol reduces Length of stay, postoperative complications, and early recovery in the surgical procedure.

Keywords: Enhanced recovery after surgery, Perioperative care, length of stay, Post-operative complication.

Introduction

Enhanced recovery after surgery protocol (ERAS) is a standardized multimodal pre-and perioperative care pathway, which aims at the early recovery of patients after a surgical procedure [1]. It is an evidence-based pathway which follows certain guidelines to improve outcomes and lower health care cost [1]. Surgery is a state of physiological stress and catabolism, that can be reduced by implementation of ERAS protocols [2]. There are many hurdles in the implementation of ERAS, to overcome this implementation requires a dedicated

multidisciplinary team, a willingness to change, and a clear understanding of the protocol. It is the patient's management covering preadmission, perioperative, and postoperative phases [2].

In our study, traditional and ERAS protocols in surgical patients were compared in terms of length of stay, recovery, and benefits to the patients.

Methods And Materials

A retrospective comparative study was carried out at a Tata main hospital, Jamshedpur, India, over a period from January 2018 to December 2019 over one hundred patients undergoing elective surgery. For this, we enrolled all the patients who underwent elective surgery (laparotomy for intestinal obstruction, Stoma closure, open cholecystectomy, radical cholecystectomy, gastrectomy and colorectal surgeries) in which we followed ERAS and traditional tenets. Those cases in which we followed traditional tenets termed as a non-ERAS group of patients. Then random selection by the third party with an equal number of patients in each group. The patients were divided, after recording baseline parameters, by stratified randomization based on the type of surgery required, into ERAS and non-ERAS groups. All data had been taken from the MRD department of TMH after permission from the concerned authority. In the non-ERAS group of patients, we follow traditional protocol which is as follow-

- vernight starvation was followed (10 h for solids as well as liquids).
- Patients undergoing stoma closure were not given solids for a period of 24 h before surgery
- Mechanical bowel preparation
- No oral carbohydrate drink was given
- Routine use of abdominal drains, urinary catheters, and nasogastric decompression
- Liberal hydration.
- Enteral nutrition is given once bowel motility restored
- Removal of all drains, catheters, and tubes have done when bowel motility is observed.

In the ERAS group of patients, we used the following strategies –

Preoperative

1 Pre-counselling of patient and family about all aspects of perioperative care and early discharge.

2. 100 g clear carbohydrate-rich beverage 2–3 h before surgery to avoid prolonged fasting.

3. Prophylaxis of nausea and vomiting (PONV) (Ondansetron 8mg iv, or Metoclopramide 10 mg iv).

4. Bowel preparation in case of Colo-rectal surgeries.

Intra-Operative

1. Antibiotic prophylaxis (Ceftriaxone 1gm IV, Metronidazole 500 mg IV, 30 mins before surgery)

2. Balanced intravenous fluid therapy (<2500 ml IV fluids)

3. Avoidance of drains and nasogastric tubes.

4. Avoidance of opioid analgesia.

5. Use of Regional anesthesia.

Post-Operative

1. Early removal of drains (<24 hrs.) and NG tubes (<24 hrs.) and urinary catheter (on 1st post-operative day).

2. Early ambulation (walking along the corridor and going to the toilet).

3. Early feeding and oral antibiotics.

4. Incentive spirometry and physiotherapy.

We compared both the groups in terms of postoperative length of stay (days from surgery to discharge), postoperative complications, and postoperative recovery parameters: early mobilization, early introduction of oral feeding gathered from the case sheets obtained from our MRD section. In some patients, there was a delay in discharge due to payment issues, hospital formalities, and social issues, etc. In those cases, we calculate

postoperative LOS from the day of surgery to discharge advised by the surgeon on the case-sheet. The discharge criteria of both the group of patients were- a) when oral intake was adequate, b) the pain was minimal or absent, c) the patient could pass urine, at least flatus with or without a stool, d) was able to ambulate independently and the wound condition was satisfactory. e) Patients were followed up after discharge at an interval of 7 and 14 days to check for wound status and then for 3 months to look for any complications or readmissions.

A total of 100 patients participated in the study, which was equally divided into ERAS and non-ERAS groups. All the patients in the ERAS group were catheterized intraoperatively, irrespective of the type of anesthesia administered. Removal of the urinary catheters was done on different days for both groups. Concerning nasogastric tube insertion, all the patients underwent tube insertion during surgery in both groups. All the patients in the ERAS group had their nasogastric tubes removed either immediately postoperatively or on day one of surgery. Concerning abdominal drain placement, in the ERAS group of patients, drains were removed on the 1st postoperative day, whereas in the non-ERAS group, abdominal drains were removed when the output reduced to <30 ml. To starting of feeds, all the patients in the ERAS group were started on sips and a liquid diet after removal of the nasogastric tube followed by a liquid or Soft or solid diet.

Statistical Analysis

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean ± SD and median. The normality of data was tested by the Kolmogorov-Smirnov test. If the normality was rejected then the non-parametric test was used.

Statistical tests were applied as follows-

1. Quantitative variables were compared using Mann-Whitney Test as the data sets were not normally distributed) between the two groups.
2. Qualitative variables were compared using Chi-Square test/Fisher's Exact test

A p-value of <0.05 was considered statistically significant. The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0.

Result

Post-operative outcome between ERAS and non-ERAS group

There was a significant difference in recovery parameters such as tolerance of oral diet on 1st postoperative day 84% in ERAS and p-value < 0.001 which is significant, mobilization on 1st postoperative day was 94% of the cases, which was also significant P-value < 0.0001 [Figure-1, Table-1]. It was also seen that in the ERAS group of patients who developed postoperative complication (surgical site infection) and readmission were less than the non-ERAS group. But P-value was not significant [Table-1].

Post-operative outcome	ERAS (n=50)	NON-ERAS (n=50)	Total	P-value	Test performed
Tolerating oral diet on 1st pod	42(84%)	0 (0%)	42(42%)	<.0001	Fisher Exact test
Mobilization on 1st pod	47(94%)	0 (0%)	47(47%)	<.0001	Fisher Exact test
Patient without complication	43(86%)	35(70%)	78(78%)	0.053	Chi-square tests=3.73
Patient with complication	7 (14%)	15(30%)	22 (22%)	0.053	Chi square tests=3.73
Readmission	4 (8%)	12(24%)	16 (16%)	0.054	Fisher Exact test
Total	50(100%)	5(100%)	100(100%)	-	-

Table 1: comparison between the postoperative outcome

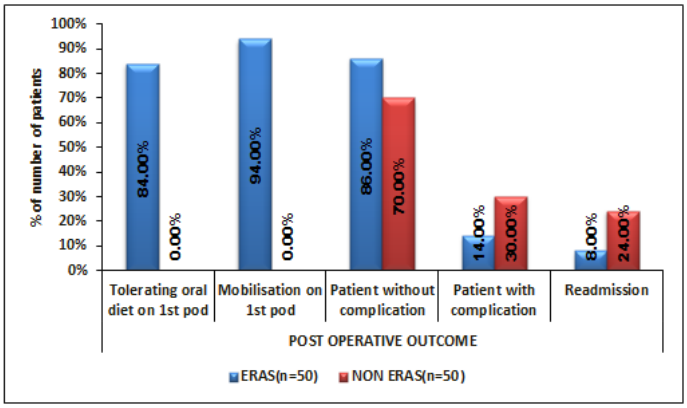

Figure 1- graphical representation of post-operative outcome between ERAS & non-ERAS group

Post-Operative Length of Stay In Eras And Non-Eras Group

We observed a statistically significant difference between ERAS and NON-ERAS group of patients in Median postoperative LOS [5 & 8 days, P<0.0001], {Table2, Figure-2} i.e. Non-ERAS group of patients had longer post-operative LOS in comparison of ERAS group of patients. Which is beneficial to the patient.

Post-operative LOS (Days)	ERAS (n=50)	Non-ERAS (n=50)	Total	P value	Test performed
4	24 (48%)	0 (0%)	24(24%)		
5	19 (38%)	0 (0%)	19 (19%)		
6	5 (10%)	8 (16%)	13 (13%)		
8	2 (4%)	22 (44%)	24 (24%)	<.0001	Chi square test,80.359
10	0 (0%)	15 (30%)	15 (15%)		
12	0 (0%)	5 (10%)	5 (5%)		
Total	50 (100%)	50 (100%)	100(100%)		
Mean ± SD	4.74 ± 0.94	8.68 ±1.74	6.71 ±2.42		
Median(IQR)	5 (4-5)	8 (8-10)	6 (5-8)	<.0001	Mann Whitney test;58
Range	4-8	6-12	4-12		

Table 2: Comparison of post-operative LOS between ERAS and NON- ERAS

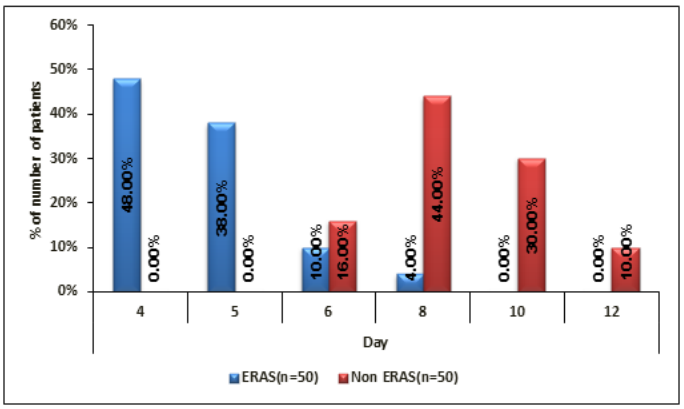

Figure 2: Graphic representation of post-operative LOS between ERAS and NON- ERAS

Discussion

ERAS protocol is effective in reducing LOS and postoperative complications, which are the emerging problems in major surgery [3&4]. It is a multimodal and multidisciplinary approach to the care of the surgical patients, involves a team consisting of surgeons, anesthetists, nurses, physicians, staff from the unit that care for the surgical patients. It reduces hospital LOS, postoperative complications, and decreases the cost of care of the patient [1&5]. Henrik Kehlet was the first who applied an idea of the evidence-based ERAS protocol in colorectal surgery in the early 1990s [6&7]. He reported that LOS decreases by 2-3 days by following the ERAS protocol. Nowadays this protocol has expanded beyond colorectal surgeries to other areas like pancreatic surgery, liver resection, urologic surgery, gynaecological surgery, and various emergency surgeries [8-13].

The ERAS-care plan is divided into, preoperative, intraoperative, and postoperative strategies-

Preoperative strategies

Preoperative strategies include counselling, bowel preparation, antibiotic prophylaxis, deep venous thrombosis prophylaxis, carbohydrate loading, reduction in fasting time, and early discharge planning. Preadmission counselling aims to decrease patient stress,

fear, anxiety related to the surgery and complications, which contain information like operation procedure, and encourages the patient, to improve peri-operative feeding, and early postoperative mobilization [14&15]. Mechanical bowel preparation (MBP), leads to dehydration, along with fluid and electrolyte imbalances such as hypocalcemia & hypophosphatemia mainly in the elderly [16], hence ERAS protocol suggests against previously standard MBP. Previously bowel preparation was used to cleanse the large bowel of solid feces and lower the bacterial content, but in fact, it liquefies the feces increasing the risk of surgical spilling, it does not reduce the number of bacterial organisms in the bowel. But in the Indian scenario, because of high fiber dietary habits, the formation of bulky stools necessitates pre-operative bowel preparation to reduce per-operative fecal contamination. In our scenario, in ERAS groups of patients, we had done bowel preparation in colorectal surgeries. Antibiotic prophylaxis prevent surgical site infection & should be used in single-dose, minimum 30-60min before skin incision. It can be repeated intraoperatively depending on the half-life of the drug and duration of the operative procedure.

It was also proven that in malignant disease and major surgery, there is a risk of venous thromboembolism. So, the risk of thromboembolic complication can be decreased by the use of low molecular weight heparin 2-12hours before surgery and continued till the patient is fully mobilized [17].

In elective surgery, midnight fasting has been standard practice, but not supported by evidence [18] because overnight fasting increases insulin resistance and discomfort after abdominal surgery. The guideline recommends an intake of clear fluid up to 2 hours before the induction of the patient as well as a fasting period of 6 hours for solids. It is also noted that the intake of carbohydrate-rich drink 2 hours before induction of patient decreases anxiety, hunger, thirst, and reduces post-operative insulin resistance [19&20]. But the pre-operative carbohydrate-rich fluid is not given to the patient with diabetes.

B) Intraoperative considerations:

It includes regional anaesthesia, prevention of hypothermia, minimizing opioid use, avoiding nasogastric (NG) tubes and drains, pain and nausea prophylaxis, and appropriate fluid administration. There are several meta-analysis and RCTs which showed in major abdominal surgery to decrease the prevalence of wound infection [21], cardiac complication [21], bleeding and transfusion requirement as well as post-anaesthetic recovery [22] by preventing hypothermia. It can be done by using a cutaneous warming (forced air) or a circulating water garment system. Postoperative nausea and vomiting are more stressful than pain as noticed by many patients. Female gender, non-smoker, history of motion sickness, and postoperative use of opioids are the risk factors for postoperative nausea and vomiting, hence the patient should receive prophylactic antiemetic medicines. It was shown that fever, atelectasis, pneumonia occurs frequently with the NG tube patient in comparison to a patient without an NG tube [1]. A Randomized controlled trial was done by R. Sapkota et.al, which showed that NG tube insertion didn't prevent gastrointestinal discomfort or anastomotic leakage after emergency laparotomy and abdominal trauma cases [23]. So, an NG tube placed during surgery should be removed before a reversal or as early as possible post-operatively. Unnecessary use of drains leads to delay in postoperative recovery due to pain and immobility and above that, it does not decrease the risk of a leak. The principle behind the use of intravenous fluid is to replace the fluid. Administration of excessive intravenous fluids results in damage to the endothelium

and accumulation of fluid in the interstitial space, causing delayed wound healing and prolonged return of normal bowel function. Administering large volumes of normal saline increase the risk of acute kidney injury.

C) Postoperative considerations:

It includes early ambulation, early oral feeds, removal of catheters or drains as soon as possible, chest physiotherapy in the form of incentive spirometry, incorporation of epidural analgesia, and opioid-sparing pain management. Promoting an early oral diet in the post-op period supplies nutrients to muscles, reduces gastric motility and bowel ileus problems associated with surgery, and prevents stress-related ulcers. Removal of urinary catheter early helps in early mobilization and urinary tract infection. There are many reports which showed that implementation of the ERAS protocol promotes a better outcome because of earlier recovery, discharge, and hospital readmission. Moydien and colleagues conducted a study of 38 subjects with isolated penetrating abdominal trauma who underwent emergency laparotomy from January to December 2013, this group was compared with 40 subjects who underwent the same emergency surgery but without an ERAS recovery protocol. They noticed the ERAS group had shorter mean LOS (5.5 vs 8.4 days, P<.00021) [24]. In 2014 Yu Z and colleagues conducted a meta-analysis of 400 patients, which showed that patients receiving ERAS perioperative care, had significantly reduced length of the stay, time to first flatus, and hospital costs [25]. In our study mean LOS in the ERAS group of patients was shorter (5 vs 8 days, P<.0001), which was statistically significant and also there was early recovery.

Conclusion

ERAS pathway is an evidence-based approach to surgical management that challenges traditional surgical management paradigms. This pathway is very effective, safe and beneficial to surgical patients concerning faster recovery, shorter length of stay, complications, and readmissions.

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