



**Impact of Enhanced Recovery After Surgery in Carcinoma Endometrium Patients Who Underwent Laparoscopic Hysterectomy: A Single Center Experience**

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**Abstract**

**Introduction:** Enhanced recovery after surgery(ERAS) were implemented with a goal of maintaining normal physiology in the entire perioperative period to improve patient outcomes and decrease the hospital stay. We report our experience following implementation of ERAS program in patients undergoing laparoscopic hysterectomies for carcinoma endometrium.

**Methods:** This study is conducted at American Oncology Institute, Vijayawada, INDIA. Total of 65 patients were included in our study over a period of 2 years. Based on the implementation of ERAS program, patients were divided into two groups as PRE ERAS and ERAS groups and were analyzed statistically using student T test and chi square test. Multimodal strategies additionally implemented in the ERAS group include preoperative, intraoperative and postoperative changes.

**Results:** Of total 65 patients ,33 patients were in PRE ERAS and 32 were in ERAS group. After implementation of ERAS, Median length of hospital stay reduced from 5 days (4 - 16) to 2 days(range: 2-5) [ $p = 0.001$ ] with significant decrease in hospital costs ( $p < 0.001$ )

**Conclusion:** Implementation of the ERAS program has significantly reduced the length of hospital stay and hospital costs in patients who underwent laparoscopic hysterectomy.

**Keywords:** Enhanced recovery after Surgery, Hysterectomy, hospital costs, Hospital stay.

## Introduction

The success, feasibility of any surgical intervention lies in the achievement of better quality of life, favorable oncological prognosis and lesser health care costs. So, postoperative complications and the survival rate remain the best quality predictive indicators. Surgical stress response induces a combination of catecholamine release and impaired immune function resulting in insulin resistance modulating perioperative outcome.[1] The goal of ERAS pathway is to maintain the normal perioperative physiology in order to decrease the postoperative morbidity.

Multimodal care in ERAS program include 15 to 20 components comprising of: preoperative counseling, preoperative nutrition optimisation, physiotherapy, decreasing preoperative fasting time, maintaining normothermia, encouraging usage of regional blocks, shorter acting analgesics, fluid management, adequate thromboprophylaxis, fewer invasive lines, early return of bowel function.[2,3,4]. So, a multidisciplinary team involvement and active intervention becomes a pivotal essence for obtaining the better compliance rates in improving the success of ERAS program.

ERAS protocols are multimodal perioperative pathways comprising 15 - 20 components of which key elements being prehabilitation, counseling, minimal fasting, multimodal analgesia, return to normal diet and early discharge from hospital. In metaanalysis , Patients who underwent colorectal surgeries have shown decrease in postoperative morbidity and shortened hospital stay even if 4-5 components are implemented among these 20 components.

ERAS has shown substantial benefits in colorectal surgeries. [5,6,7] ERAS have shown promising results in gynecologic oncology surgeries in terms of length of hospital stay, in hospital morbidity, readmissions and costs. [7,8,9]

Few studies in the literature have shown postoperative outcomes in patients who underwent laparoscopic hysterectomy in whom ERAS program was implemented. In our study we tried to show the ERAS protocol implemented and its postoperative outcomes , length of hospital stay and hospital costs.

## Methodology

This is a single institutional non randomized cohort study done over a period of two years from September 2011 - September 2022 at American Oncology Institute, Vijayawada. The study was approved by the institutional ethical board. Informed consent was obtained from all the patients . All patients undergoing

surgery were evaluated by a multidisciplinary team consisting of surgical oncologist , medical oncologist, anesthesiologist, intensivist, physiotherapist as per institutional guidelines protocol. All patients who underwent laparoscopic Hysterectomy for carcinoma endometrium and in addition who agreed for ERAS protocol were included in the study. Patients refusal , BMI > 40 kg/m<sup>2</sup> , change of plan from laparoscopic to laparotomy, Intraoperative complications were excluded from the study.

**Enhanced Recovery After Surgery (ERAS) followed at our institute:**

**We subdivided into following 3 components:**

**a) Preoperative :**

Preoperatively at the time of admission patients were counseled regarding the nature , type of surgery, prehabilitation in terms of nutritional and anemia correction, preoperative exercises for at least 6 weeks prior to surgery, early mobilization, early oral intake post surgery and early discharge from the hospital. Mechanical bowel preparation , Preoperative sedatives were omitted prior to surgery. Thromboprophylaxis achieved at our institute by 3 forms by low molecular weight heparin 1 mg/kg started preoperatively and continued till the day of discharge and other 2 are by pneumatic compression device and stockings. Oral or mechanical bowel preparation is routinely not followed at our institute. Cefixime is the antibiotic of choice at our institute and one shot administered 1 hour prior to surgery. 300 ml of ensure plus containing 50 g of carbohydrate was given 3 hours prior to surgery.

**Intraoperative:**

General anesthesia with endotracheal intubation performed for all patients undergoing surgery. Preoperatively before induction 1g of paracetamol and 75mg diclofenac administered before surgical incision and before extubation, under ultrasound guidance bilateral erector spinae block performed at T10 level with 0.2% Ropivacaine. Intraoperatively, Total intravenous anesthesia with propofol was the maintenance anesthesia choice, intermediate acting fentanyl was the opioid of choice on requirement. Intraoperative fluids were administered at the rate of 2 - 4 ml/kg, and on hypotension vasopressors were administered. For Postoperative, nausea vomiting prophylaxis two antiemetics were administered , 0.15mg/kg ondansetron, 0.1 mg/kg Dexamethasone intravenously. Normothermia was maintained throughout the procedure with warm air blankets, forced air warmer and ambient OT temperature.

### **Postoperative:**

Patients were shifted to ward after postoperative monitoring. Patients were allowed to take liquids and solids 4 hours and 6 hours postoperatively. Patients were asked to mobilize for at least 15 min on POD 0 and for 2 hours post surgery. Analgesia was supplemented with iv 1g paracetamol TID and Intravenous Tramadol 2 mg/kg only on requirement, Numerical rating scale was used to assess the postoperative pain ranging from 0 - 10, 0 as no pain and 10 being worst pain. Antiemetics were continued on POD1 and patients were discharged on POD 2.

In the PRE ERAS group, no such protocol is followed, routine methods as per surgeon and anesthetist choices were implemented. The additional changes not implemented in PRE ERAS were 1) Thromboprophylaxis regimen, 2)Precarb drink 3) Prehabilitation 4) Premedication were given in PRE ERAS group 5)No Regional block 5) Morphine and fentanyl indigenous usage 6) No oral diet and mobilization till POD1

Both the Pre ERAS and ERAS group were compared statistically in terms of length of ICU and hospital stay, opioid requirement,intraoperative fluids administered, hospital costs,postoperative morbidity in terms of sepsis, thromboembolism, wound infection, nausea, vomiting, renal, cardiac or any electrolyte abnormalities.

### **Statistical Analysis**

#### **Results**

Total of 65 patients were enrolled in our study, out of which 33 patients were included in PRE ERAS group and 32 patients in ERAS group. Demographically, both the groups were comparable in terms of age, BMI, ASA status, comorbidities, previous surgeries and indications as shown in table 1. In both the group the common indication were women diagnosed with carcinoma endometrium.

Intraoperatively, there was no significant difference in duration of surgery. There were nil intraoperative complications noticed in both the groups. Long acting opioid morphine were used only in pre ERAS and none in ERAS group ( $p < 0.0001$ ) Erector spinae block was performed in all pre ERAS and none in ERAS group ( $p < 0.001$ ). Mode of maintenance anesthesia in Pre ERAS group, inhalational ( $n = 25$ ), TIVA ( $n = 8$ ) vs in ERAS group only TIVA ( $n=32$ ) was the mode [ $p < 0.001$ ]. We found a significant difference in intraoperative fluids administered with mean  $\pm$  SD [  $2494 \pm 588$  ] in Pre ERAS group vs  $1250 \pm 422$  in ERAS group with ( $p < 0.02$ ) as shown in Table 2:

Most of the patients in ERAS group were discharged on POD 2 with significant decrease in length of hospital stay in Pre ERAS vs ERAS group ( $p < 0.05$ ) with median length of hospital stay of 5 vs 2 days [ $p < 0.05$ ]. One patient in Pre ERAS group had thromboembolism episode followed which patient was reviewed , reintubated and mechanically ventilated for 3days and patient was discharged on POD 12. Post operative complications did not show any significant statistical difference as shown individually in Table 3. There is decrease in opioid requirement ( $p < 0.04$ ) in ERAS group postoperatively but no as such significant difference noticed in numerical rating scale(NRS). One major statistical difference noticed was decrease in hospital costs  $p < 0.001$  [ median 503400 vs 200400 in Pre ERAS vs ERAS group ].

In Table 4 we depict the compliance observed in both the groups. Mean total compliance achieved in ERAS group at our hospital is around 92% ranging from 80% - 100%. Target length of hospital stay is achieved by fulfilling more than 9 parameters.

## **Discussion**

The success, feasibility of any surgical intervention lies in the achievement of better quality of life, favorable oncological prognosis and lesser health care costs. So, postoperative complications and the survival rate remain the best quality predictive indicators. Postoperative complications can significantly impact on quality of life, may delay other treatments, and may be associated with early recurrence following any major oncology surgery[10] . In recent years, Enhanced recovery after surgery (ERAS) program have shown promising results in terms of minimizing surgical stress response, reducing postoperative complications, and shortening the length of hospital stay following major surgeries . Multimodal care in ERAS program include 15 to 20 components comprising of: preoperative counseling, preoperative nutrition, optimisation, physiotherapy, decreasing preoperative fasting time, maintaining normothermia, encouraging usage of regional blocks, shorter acting analgesics, fluid management,

adequate thromboprophylaxis, fewer invasive lines, early return of bowel function [11,12,13]. So, a multidisciplinary team involvement and active intervention becomes a pivotal essence for obtaining the better compliance rates in improving the success of ERAS program. we tried to discuss in detail the changes implemented and the compliance rate established by the anesthesiologist in successfully implementing the ERAS program.

### **Preoperative analysis:**

Preoperative optimization includes preoperative counseling, smoking and alcohol consumption abstinence, initiation of deep breathing exercises, incentive spirometry, bowel preparation, fastening guidelines, preoperative carbohydrate loading, immunotherapy, appropriate thromboprophylaxis, albumin and hemoglobin correction. Preoperative cessation of smoking 14 and alcohol 15 have shown beneficiary outcomes in terms of improved wound healing, pulmonary function test and decreased postoperative complications. At our institute, 8 weeks of abstinence from smoking and alcohol have been followed in both pre ERAS and in ERAS group. Preoperative albumin and hemoglobin optimization was followed both in the pre ERAS and ERAS group. Mechanical bowel preparation with oral antibiotics is followed in both groups with no additional changes. Preoperative fasting guidelines for solids and liquids were the same in both groups. Cassandra[15] in their study have shown preoperative carbohydrate loading helped in reducing insulin resistance, and had a positive impact on perioperative glucose control, which we followed only in our ERAS group. Chest physiotherapy and spirometry have improved functional status and expedited the recovery in patients undergoing major abdominal surgeries[16], which is cent percent implemented in all patients in the ERAS group.

Venous Thromboembolism is a major risk in gynecologic oncology surgeries accounting to 4 - 8% risk of thrombosis. In addition to carcinoma being risk factor the additional factors which include BMI, pelvic surgery, immobility, recipient of chemotherapy are the independent risk factors for thromboembolism in patients undergoing hysterectomy. [17,18,19,20,21]. So throughout the hospital stay at our institute we start a low molecular weight heparin thromboprophylaxis and perioperatively supplement with pneumatic compression devices and stockings till the day of discharge. Intravenous antibiotics were administered as per institutional protocol. Skin preparation done with 2% chlorhexidine and 70% isopropyl alcohol solution along with vaginal betadine preparation to all patients.

Intraoperative fluid management plays a pivotal role in the ERAS program. Fluid overload perioperatively have shown adverse effects like pulmonary congestion, peripheral oedema, delayed return of bowel function and restricted fluids had its adverse outcomes on renal function. Our target in ERAS group is to administer crystalloids of range 2 - 4 ml/kg/hr with target urine output of 0.3 - 0.4 ml/kg/hr. We have noticed a significant decrease in usage of crystalloids following Goal directed fluid therapy in the ERAS group. Hypothermia has shown adverse effects in terms of delayed wound healing, coagulopathy, arrhythmias, and bleeding. [22] So, in our ERAS group we tried temperature not to drop below 1° c with ambient OT temperature, warm blankets, warm fluids and forced air warmers. Another cornerstone in the ERAS program is implementation of multimodal analgesia. Gelman et al<sup>23</sup> in their study have shown use of short acting opioids, regional techniques decreased the postoperative ileus, shorter length of hospital stay and improved the quality of life. In our ERAS group none of the patients had received long acting opioids and every patient received ultrasound guided erector spinae block with 0.2% Ropivacaine on either side. The Numerical rating scale was maximum around 2-3 in ERAS with only 2 patients requiring postoperative opioid in ERAS group (p < 0.04). Postoperative nausea and vomiting remains the major postoperative complication delaying the discharge of patients undergoing laparoscopic surgeries. 3 patients had PONV in PRE ERAS group and none in ERAS group due to dual post operative nausea vomiting prophylaxis in ERAS group ( p< 0.05). Postoperative early mobilization remains the main stay in the ERAS program which helps in preventing thromboembolic episode, reducing insulin resistance and shortening hospital stay. [24] Preoperative counseling, multimodal analgesia and encouragement in postoperative period has significantly improved the mobilization post surgery in ERAS group. Postoperative complications showed decrease in ERAS group in comparison to pre ERAS group . The complications in PRE ERAS and ERAS group respectively : Sepsis ( 9% vs 4%), thromboembolism ( 3% vs 0%), electrolyte disturbances ( 13% VS 0%), no renal and cardiac complications were noted .

One important priority currently is to reduce the health care costs. Shortening length of hospital stay is associated with the reduction in health care costs and improves the psychological impact of the patient. In our study, there is 2 days median shortening of hospital stay as well as 1 day median shortening in length of ICU stay in ERAS group. Magdalena piraka [25] in their article divided compliance with ERAS protocol into 3 groups: < 70%, 70 - 90%, > 90% as low, high and strict adherence and found , strict adherence group improves short term outcomes in comparison to other groups. In our study we had 92% compliance in the ERAS group making the higher compliance success achievement.



## Conclusion

Implementation of ERAS programs have significantly reduced the length of hospital stay and hospital costs which are the major qualitative predictors of any surgery. Additionally, we saw a significant decrease in hospital morbidity with highest compliance rate achievement.

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