



Comparison of post-operative outcomes of enhanced recovery after surgery protocol in laparoscopic cholecystectomy with the traditional methods of recovery: A prospective comparative study

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ABSTRACT

Background: Enhanced recovery after surgery (ERAS) can significantly decrease the length of hospital stay, lessen complications, prejudice the rehospitalization rate, and cut down hospitalization costs. ERAS protocols in laparoscopic surgery have not been fully researched in the Indian setting, especially in government medical colleges. Considering that Indian Hospitals and Government Medical Colleges are already overburdened and overcrowded, ERAS can help alleviate the stress on the hospitals by facilitating early discharges. It is of extreme importance that we have good data and research on the use of ERAS protocols in GMCs and other government hospitals.

Aims and Objectives: The aims and objectives of this study were to compare the post-operative outcomes of ERAS protocol in laparoscopic cholecystectomy with the traditional methods of recovery. **Materials and Methods:** Using convenient sampling patients undergoing laparoscopic cholecystectomy were randomized and divided into two groups: the ERAS group and the traditional Group. **Results:** The mean length of stay (LOS) was 19.06 h (10.50 SD) in the ERAS group versus 57.17 h (8.89 SD) in the traditional group ($P < 0.0001$ using the unpaired t-test). The mean Visual Analog Scale was 3.65 (2.28 SD) in the ERAS group versus 6.95 (1.63SD) in the traditional group ($P = 0.0078$ using the unpaired t-test). Clinically significant post-operative nausea and vomiting (PONV) was seen in 4 out of 92 patients (8.3%) in the ERAS group versus 20 of the 92 patients (21.7%) in the traditional approach. **Conclusion:** Our findings reinforce the notion that the traditional approach of peri-operative care is associated with worse outcomes and ERAS protocols improve PONV and post-operative pain and decrease the LOS.

Key words: Enhanced recovery after surgery; Cholecystectomy; Laparoscopic; Postoperative nausea and vomiting; Length of stay; Postoperative pain

INTRODUCTION

Laparoscopic cholecystectomy is a widely used surgical procedure, where recovery varies according to the pre-operative and post-operative conditions and interventions in the hospital. Recovery of a patient after a surgery is

influenced by many factors¹ including anxiety about surgery, post-operative nausea, and vomiting (PONV), decreased physical activity pre-operative and post-operative, early intake of food after surgery, early mobility post-operative.² which can ERAS by a significant margin. The concept of enhanced recovery after surgery (ERAS) was first described

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by Kehlet in 1997, in the setting of colorectal surgery.³⁻⁵ For colorectal surgery, a working group developed and modified consensus guidelines for ERAS programs in 2005 and 2009.^{6,7}

ERAS protocols are based on the idea that perioperative outcomes can be improved by reducing the “metabolic stress” experienced by the patient by reducing prolonged fasting and carb loading the patient 2 h preoperatively.⁸ Moreover, postoperatively a state of insulin resistance develops in otherwise healthy individuals and persists for 2–3 weeks.⁹ Surgical stress also increases post-op blood glucose.¹⁰ Studies have found that post-operative hyperglycemia is associated with a higher risk of surgical site infections and other complications.^{11,12}

Carb-loading is a good method to induce a metabolically fed state and reduce post-operative insulin resistance.¹¹

These ERAS programs addressed issues including preadmission information and counseling, standard anesthetic protocol, prevention of post-operative ileus, laparoscopy-assisted surgery, post-operative analgesia, post-operative nutritional care, and early mobilization.

ERAS protocols are widely practiced in elective surgeries. ERAS can significantly decrease the length of hospital stay, lessen complications, prejudice the rehospitalization rate, and cut down hospitalization costs. A few retrospective studies have suggested that the use of the ERAS strategy is effective and safe for laparoscopic cholecystectomy. Some studies have reported that ERAS protocols reduce the length of hospital stay, reduce anxiety, and improve overall patient comfort.^{1,13,14}

A meta-analysis also showed that ERAS protocols in major surgery reduce the recovery time and length of stay (LOS) by 2–3 days and complications by 30–50%.¹⁵ Although initially developed for colorectal surgery, these protocols have extended to hepatobiliary, cardiac and urology as well. A meta-analysis of ERAS protocols in laparoscopic gastrointestinal surgery indicated that patients in the ERAS protocol group had significantly shorter postoperative LOS.¹⁶ The meta-analysis also revealed that the patients in the ERAS protocol had markedly lower complication rates. ERAS protocols are not well-studied in Indian Public Hospitals. Considering that Indian Hospitals and Government Medical Colleges are already overburdened and overcrowded, ERAS can help alleviate the stress on the hospitals by facilitating early discharges. ERAS protocols in laparoscopic surgery have not been fully researched in the Indian setting, especially in government medical colleges. It is of extreme importance that we have good

data and research on the use of ERAS protocols in GMCs and other government hospitals. Therefore, given the lack of convincing evidence for Indian hospitals, we wanted to assess the efficacy and safety of ERAS protocols by conducting this study in a Government Medical College.

- ERAS protocol includes but is not limited to
- Pre-admission counseling,
- Carbohydrate loading- 2 h preoperatively
- Standard NPO guidelines- Solids- 6 h, Liquids- 4 h, Clear liquids 2 h,
- No use of pre-operative analgesia, anxiolytics, and anti-emetics,
- Use of short-acting anesthetic agents
- Avoidance of long-acting opioids
- Short incisions,
- Routine mobilization care pathway,
- Using ESP block
- Post-operative early mobilization
- Post-operative early feeding,
- Early discharge
- Stimulation of gut motility
- Adapted from Gustafsson et al., and Ljungqvist.^{17,18}

Aims and objectives

The aims and objectives of this study were to compare the postoperative outcomes of ERAS protocol in laparoscopic cholecystectomy with the traditional methods of recovery.

The primary outcome was the post-operative LOS, whereas the secondary outcomes were PONV and Visual Analog Scale (VAS).

MATERIALS AND METHODS

Using convenient sampling patients undergoing laparoscopic cholecystectomy (from May 2022 to December 2023) were randomized and divided into two groups: the ERAS group and the traditional Group.

Inclusion criteria

1. Patients undergoing laparoscopic cholecystectomy.

Exclusion criteria

1. American Society of Anesthesiologists (ASA IV) and ASA V
2. Patient undergoing an acute attack of cholecystitis
3. Patient experiencing complications during extubation
4. Patient with common bile duct injury
5. Patient converted from laparoscopic to open cholecystectomy
6. Longer duration (>3 h) of General anesthesia during surgery.

ERAS protocol used for this study		
Pre-op	Intra-op	Post-op
Pre-admission counseling and in-depth procedure explanation to the patient. Standard NPO guidelines- Solids- 6 h, Liquids- 4 h, Clear liquids- 2 h, Carbohydrate loading- 2 h preoperatively.	Standard anesthetic technique to maintain homeostasis and reduce stress. Aggressive PONV prevention strategy Multimodal analgesia regimen including USG-guided TAP block	Early mobilization, i.e., after 4 h of surgery Early (when lucid after surgery) oral intake of fluids and solids Encouragement of early passing of urine Early discharge from the hospital i.e., same day in the evening or the next morning Early discharge

USG: Ultrasound, PONV: Post-operative nausea and vomiting

Table 1: Comparison of outcomes in the ERAS group versus the traditional group

Variable tested	ERAS group	Traditional group	P-value
LOS	19.06 h (10.50 SD)	57.17 h (8.89 SD)	<0.0001
VAS	3.65 (2.28 SD)	6.95 (1.63SD)	0.0078
PONV	8.3%	21.7%	0.001025

ERAS: Enhanced recovery after surgery, LOS: Length of stay, VAS: Visual analog scale, PONV: Post-operative nausea and vomiting

Adapted from Gustafsson et al., and Ljungqvist.^{17,18}

LOS was measured from the morning of surgery till discharge criteria were met.

The discharge criteria included:

1. Stable vitals
2. Per-abdomen soft
3. A healthy scar
4. Accepting oral feeds (solids+liquids)
5. Adequate mobilization (able to perform routine activities)
6. Passing flatus/stools
7. Pain should be manageable with oral analgesics
8. There must be minimal nausea, vomiting, and dizziness
9. There must be no or minimal bleeding.

PONV was measured using the PONV intensity scale.¹⁹

Statistical analysis

An unpaired t-test was done to compare the mean values of VAS and LOS and to calculate their respective P-value. Chi-square test was done for the PONV, and the P-value was calculated accordingly.

RESULTS

Of the 92 patients in the ERAS group and 92 in the Traditional group, the mean age was 33.13 (8.86 SD) and 31.86 (8.37 SD) $P=0.3189$:

20 were male (21.7%), and 72 were female (78.3%) in the ERAS group. 12 were male (13.04%), 70 were female (86.95 %) in the traditional group.

The mean LOS was 19.06 h (10.50 SD) in the ERAS group versus 57.17 h (8.89 SD) in the traditional group ($P<0.0001$ using the unpaired t-test) (Table 1).

The mean VAS was 3.65 (2.28 SD) in the ERAS group versus 6.95 (1.63 SD) in the traditional group ($P=0.0078$ using the unpaired t-test).

Clinically significant PONV was seen in 4 out of 92 patients (8.3%) in the ERAS group versus 20 of the 92 patients (21.7%) in the traditional approach. The Chi-square statistic with Yates correction is 10.7812. The $P=0.001025$. Significant at $P<0.05$.

DISCUSSION

We concluded that the ERAS protocol for laparoscopic cholecystectomy is an effective way to improve patient outcomes such as PONV, LOS, and post-operative pain.

In a similar study¹³ conducted in The People's Hospital of Fengqing, the length of hospital stay after surgery was shorter (4.06 vs. 4.61 days, $P<0.05$), whereas the mean LOS was 19.06 h (10.50 SD) in the ERAS group versus 57.17 h (8.89 SD) in the traditional group ($P<0.0001$ using the unpaired t-test). The VAS score in the former study was VAS score (3.10 vs. 3.57 points, compared to the eraser group $P<0.001$). We observed that the VAS was 3.65 (2.28 SD) in the ERAS group versus 6.95 (1.63SD) in the traditional group.

A study conducted in Kasturba Medical College and Hospital, Manipal showed no difference in PONV in the two groups while we observed that clinically significant PONV was seen in 4 out of 92 patients (8.3%) in the ERAS group versus 20 of the 92 patients (21.7%) in the traditional approach. The $P=0.001025$. A meta-analysis²⁰ about ERAS for patients undergoing bariatric surgery showed a statistically significant ($P<0.01$) reduction of PONV. Our study was not blinded, and more research is needed on patients with varying comorbidities.

Our findings reinforce the notion that the traditional approach of peri-operative care is associated with worse outcomes and ERAS protocols improve PONV and post-operative pain and decrease the LOS.

Limitations of the study

- **Single-Center Study:** The study was conducted at a single government medical college, which may limit the generalizability of the findings to other healthcare settings, including private hospitals and tertiary care centers.
- **Non-Blinded Design:** The study was not blinded, which could introduce potential biases in patient-reported outcomes such as pain scores (VAS) and nausea (PONV).
- **Convenience Sampling:** The study used a convenient sampling method, which may not be fully representative of the general population undergoing laparoscopic cholecystectomy.
- **Small Sample Size:** The study included only 92 patients in each group, which may limit statistical power and the ability to detect differences in less common complications.
- **Variability in Anesthetic and Surgical Techniques:** Although standardized ERAS protocols were followed, there may still be variations in surgical and anesthetic techniques that could influence outcomes.

CONCLUSION

This study demonstrates that the Enhanced Recovery After Surgery (ERAS) protocol significantly improves postoperative outcomes in patients undergoing laparoscopic cholecystectomy compared to the traditional recovery approach. Patients in the ERAS group had a markedly shorter length of hospital stay, lower postoperative pain scores, and a reduced incidence of postoperative nausea and vomiting (PONV). These findings reinforce the notion that traditional perioperative care is associated with prolonged recovery and increased patient discomfort, whereas ERAS protocols optimize recovery by minimizing surgical stress, promoting early mobilization, and facilitating early discharge. Given the high patient burden in government medical colleges and hospitals in India, implementing ERAS protocols can help alleviate hospital overcrowding and improve resource utilization. However, further multicenter studies with larger sample sizes, long-term follow-ups, and cost-effectiveness analyses are necessary to validate these findings and facilitate widespread adoption of ERAS protocols in routine clinical practice.

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AY- Definition of intellectual content, literature survey, prepared first draft of manuscript, implementation of study protocol, data collection, data analysis, manuscript preparation and submission of article; **RA**- Concept, design, clinical protocol, manuscript preparation, editing, and manuscript revision; **RRS**- Design of study, statistical analysis and interpretation; **SSL**- Review manuscript.

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