



Original Article

Enhanced Recovery After Surgery (ERAS) Versus Conventional Perioperative Care in Elderly Patients Undergoing Emergency Surgery for Hollow Viscus Perforation Peritonitis: A Randomized Controlled Trial

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ABSTRACT

Background: Enhanced Recovery After Surgery (ERAS) is a multidisciplinary, evidence-based perioperative care pathway designed to reduce surgical stress and accelerate postoperative recovery. Although ERAS protocols have demonstrated significant benefits in elective gastrointestinal surgery, their effectiveness in emergency surgical settings remains uncertain. This study aimed to evaluate the impact of ERAS protocols on postoperative recovery and hospital stay in elderly patients undergoing emergency surgery for hollow viscus perforation peritonitis.

Material and Methods: A prospective randomized controlled study was conducted in the Department of General Surgery at Dr. Sampurnanand Medical College, Jodhpur, Rajasthan, India. Fifty patients aged >50 years diagnosed with hollow viscus perforation peritonitis and undergoing emergency exploratory laparotomy were included. Patients were randomly allocated into two groups: an ERAS group (n = 25) and a conventional perioperative care group (n = 25). The ERAS group received a structured perioperative protocol including early mobilization, multimodal analgesia, early enteral nutrition, and optimized fluid management, while the control group received standard perioperative care. Primary outcomes included duration of hospital stay and postoperative recovery parameters such as return of bowel function and early ambulation. Statistical analysis was performed using the chi-square test and unpaired t-test.

Results: The mean age of patients in the ERAS group was 63.08 ± 7.27 years, compared with 64.48 ± 7.57 years in the conventional care group. Male patients constituted the majority in both groups. The ERAS group demonstrated a statistically significant reduction in hospital stay (mean 7.2 days) compared with the conventional care group (mean 12.56 days) ($p < 0.001$). Additionally, patients managed under ERAS protocols showed earlier mobilization and faster restoration of bowel function.

Conclusions: Implementation of ERAS protocols in elderly patients undergoing emergency laparotomy for hollow viscus perforation peritonitis significantly shortens hospital stay and improves postoperative recovery compared with conventional perioperative care.

Keywords: Enhanced Recovery After Surgery; ERAS protocol; emergency laparotomy; hollow viscus perforation; peritonitis; postoperative recovery; elderly patients.

INTRODUCTION (REVISED ACCORDING TO JOURNAL GUIDELINES)

Enhanced Recovery After Surgery (ERAS) is a multidisciplinary, evidence-based approach to perioperative care designed to reduce the physiological stress associated with surgery and facilitate faster postoperative recovery. ERAS pathways integrate several perioperative strategies, including optimized analgesia, early mobilization, judicious fluid management,

and early initiation of oral nutrition. These interventions aim to maintain physiological stability, reduce postoperative complications, and shorten hospital stay. Over the past two decades, ERAS protocols have been widely adopted in elective gastrointestinal surgery and have demonstrated significant improvements in postoperative outcomes and recovery.

Traditional perioperative management has historically involved prolonged preoperative fasting, delayed postoperative feeding, liberal intravenous fluid administration, routine use of nasogastric tubes, and extended bed rest. Increasing evidence suggests that these conventional practices may delay recovery and contribute to postoperative complications. ERAS protocols were therefore developed to provide a structured perioperative care pathway that minimizes surgical stress and promotes early functional recovery.

While the benefits of ERAS protocols are well established in elective surgical procedures, their application in emergency surgery remains limited. Emergency laparotomy for hollow viscus perforation with generalized peritonitis is a common surgical emergency associated with significant morbidity and prolonged hospitalization. The condition is particularly challenging in elderly patients, who often have reduced physiological reserve and multiple comorbidities, making them more vulnerable to postoperative complications.

Although certain components of ERAS protocols may be difficult to implement in emergency situations, several elements such as optimized analgesia, early mobilization, and early enteral nutrition may still be applicable. However, evidence evaluating the effectiveness of ERAS protocols in emergency gastrointestinal surgery, particularly in elderly patients, remains scarce.

Therefore, the objective of the present study was to evaluate the impact of ERAS protocols on postoperative recovery and duration of hospital stay in elderly patients undergoing emergency laparotomy for hollow viscus perforation peritonitis.

MATERIALS AND METHODS

Study Design and Setting

This prospective randomized controlled trial was conducted in the Department of General Surgery at Dr. Sampurnanand Medical College and Associated Hospitals, Jodhpur, Rajasthan, India. The study was carried out over a period of one year. The study protocol was approved by the Institutional Ethics Committee of Dr. Sampurnanand Medical College, and written informed consent was obtained from all participants or their legally authorized representatives before enrollment.

Study Population

A total of 50 patients aged more than 50 years who were diagnosed with hollow viscus perforation peritonitis and required emergency exploratory laparotomy were included in the study.

Inclusion Criteria

- Patients were eligible for inclusion if they met the following criteria:
- Age greater than 50 years
- Radiological or intraoperative diagnosis of hollow viscus perforation peritonitis
- Undergoing emergency exploratory laparotomy

Exclusion Criteria

- Patients were excluded if they had:
- History of redo laparotomy
- Immunocompromised status
- Severe comorbid conditions that could significantly affect postoperative recovery
- Patients undergoing laparoscopic procedures

Sample size calculation

Sample size was calculated at alpha error 0.05 and study power 90% using the formula for hypothesis testing for two population mean -

$$n = \frac{2 \times (Z_{1-\alpha/2} + Z_{1-\beta})^2 \times \sigma^2}{(\mu_1 - \mu_2)^2}$$

Where,

n = Sample size

$(Z_{1-\alpha/2})$ = Standard normal deviate for alpha error (taken as 1.96 for alpha error 0.05)

$(Z_{1-\beta})$ = Standard normal deviate for beta error (taken as 1.28 for 90% study power)

σ = pooled standard deviation for length of hospital stay taken as 3.59 as per pathrikar et al.

$$\sigma^2 = \frac{s_1^2 + s_2^2}{2}$$

Where, s_1 and s_2 are the standard deviations of the two samples.

$\mu_1 - \mu_2$ = The difference in length of hospital stay between the two population [taken as 3.6 as per finding of pathrikar et al]^[16].

Sample size was calculated to be a minimum of 21 subjects in each group, which was round to 25 subjects in each group.

Randomization and Study Groups

Eligible patients were randomly allocated into two groups using a computer-generated randomization sequence

Type – simple randomisation.

Allocation was performed in a 1:1 ratio into the following groups:

- **Enhanced Recovery After Surgery group (ERAS):** 25 patients
- **Conventional care group (CON):** 25 patients

Blinding of surgeons and patients was not feasible due to the nature of the interventions.

ERAS Protocol

Patients assigned to the ERAS group were managed according to a structured perioperative care protocol incorporating evidence-based ERAS principles.

Preoperative Management

Preoperative measures included patient counselling regarding the surgical procedure and postoperative recovery plan. Preoperative fasting was minimized whenever feasible. Prophylactic intravenous antibiotics (ceftriaxone 1 g) were administered before surgical incision. Thromboprophylaxis was provided using low-molecular-weight heparin when not contraindicated. Preoperative carbohydrate loading was administered when the patient's clinical condition permitted.

Intraoperative Management

During surgery, goal-directed fluid therapy was used to maintain optimal hemodynamic status. Intraoperative normothermia was maintained using warming devices. Surgical drains were used selectively. Multimodal analgesia was administered using intravenous paracetamol and nonsteroidal anti-inflammatory drugs to reduce opioid consumption.

Postoperative Management

Postoperative care in the ERAS group emphasized early recovery strategies. Early oral feeding was initiated once bowel sounds were present and the patient was clinically stable. Early mobilization was encouraged within 24 hours after surgery. Intravenous fluid administration was restricted to avoid fluid overload. Nasogastric tubes were removed as early as clinically feasible, and opioid use was minimized.

Conventional Perioperative Care

Patients in the conventional care group received standard perioperative management. This included prolonged preoperative fasting, routine nasogastric decompression, liberal intravenous fluid administration, delayed oral feeding until full bowel function returned, and delayed mobilization.

Outcome Measures

The primary outcome of the study was duration of hospital stay. Secondary outcomes included postoperative complications such as surgical site infection, anastomotic leak, and enterocutaneous fistula, as well as recovery indicators including early mobilization and return of bowel function.

Statistical Analysis

Data were collected using a standardized data collection form and analyzed using the Statistical Package for the Social Sciences (SPSS) software version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. Comparisons between groups were performed using the unpaired t-test for continuous variables and the chi-square test for categorical variables. A p-value less than 0.05 was considered statistically significant.

RESULTS

A total of 50 patients were included in the study and were randomly allocated into two groups: the Enhanced Recovery After Surgery (ERAS) group (n = 25) and the conventional perioperative care group (CON) (n = 25). No patients were lost to follow-up during the study period.

The age distribution of patients in both groups is summarized in **Table 1**. Most patients belonged to the 61–70 year age group in both study groups. The comparison of mean age between the two groups is presented in **Table 2**, which shows that there was no statistically significant difference in age distribution between the ERAS and conventional care groups ($p > 0.05$).

Gender distribution of the study population is shown in **Table 3**. Male patients constituted the majority in both groups, indicating comparable baseline demographic characteristics between the groups.

Postoperative complications observed in the two groups are summarized in **Table 4**. Surgical site infection was the most commonly observed complication. Overall, postoperative complications were less frequent in the ERAS group compared with the conventional care group.

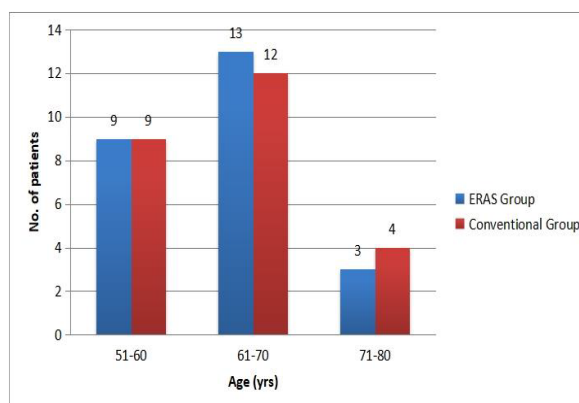
The duration of hospital stay among patients in both groups is presented in **Table 5**. Patients managed under the ERAS protocol were discharged earlier compared with those receiving conventional perioperative care.

The comparison of mean duration of hospital stay between the two groups is shown in **Table 6**. The ERAS group demonstrated a significantly shorter mean hospital stay compared with the conventional care group ($p < 0.001$).

Age Distribution

Age (yrs)		ERAS Group		Conventional Group	
		N	%	N	%
51-60		9	36.00	9	36.00
61-70		13	52.00	12	48.00
71-80		3	12.00	4	16.00
Total	25	100.00	25	100.00	

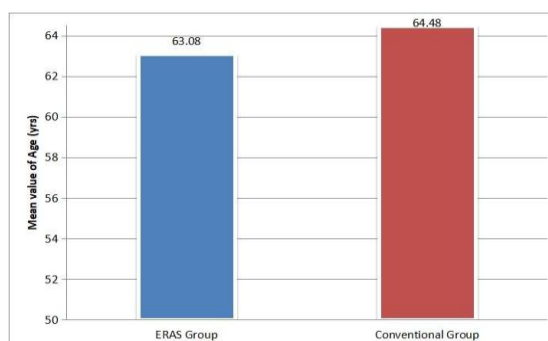
Table 1: comparison of age distribution between the both groups



Mean Age

Group	Age(yrs)			P-value
	Mean	SD	Median	
ERAS Group	63.08	7.27	64	0.508 (Not-Significant)
Conventional Group	64.48	7.57	65	

Table 2: comparison of mean age between the both groups

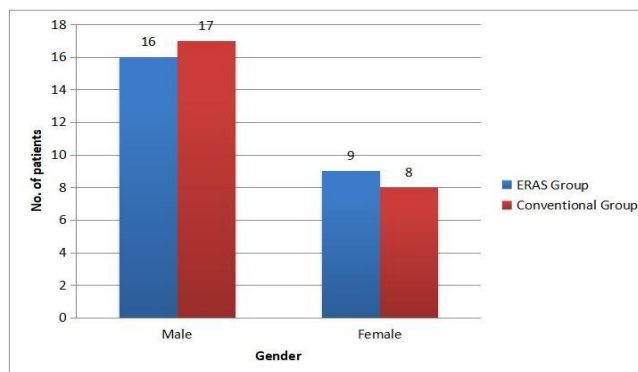


The difference was not statistically significant.

Gender Distribution

Table 3: comparison of gender distribution between the both groups

Gender	ERAS Group		Conventional Group	
	N	%	N	%
Male	16	64.00	17	68.00
Female	9	36.00	8	32.00
Total	25	100.00	25	100.00

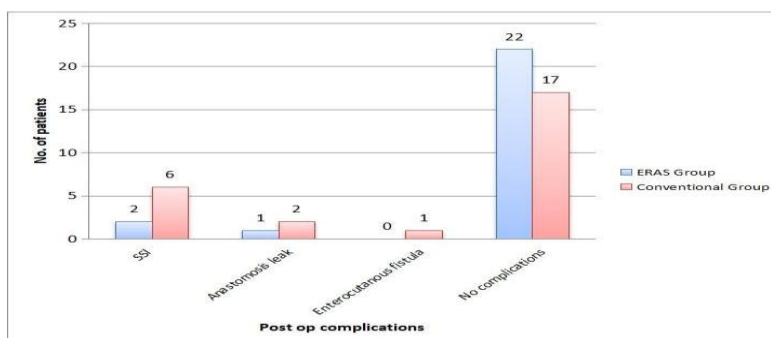


Male predominance was observed.

Post-operative complications

Post op Complications	ERAS Group		Conventional Group	
	N	%	N	%
SSI	2	8.00	6	24.00
Anastomosis leak	1	4.00	2	8.00
Enterocutaneous fistula	0	0.00	1	4.00
No complications	22	88.00	17	68.00

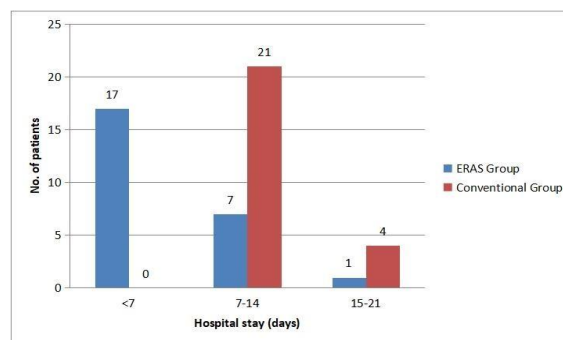
Table 4: comparison of post op complications between the both groups



Duration of hospital stay

Hospital stay (days)	ERAS Group		Conventional Group	
	N	%	N	%
<7	17	68.00	0	0.00
7-14	7	28.00	21	84.00
15-21	1	4.00	4	16.00
Total	25	100.00	25	100.00

Table 5: comparison of duration of hospital stay between the both groups



Mean hospital stay

Group	Hospital stay (days)			P value
	Mean	SD	Median	
ERAS Group	7.2	3.66	6	<0.0001 (S)
Conventional Group	12.56	4.38	12	

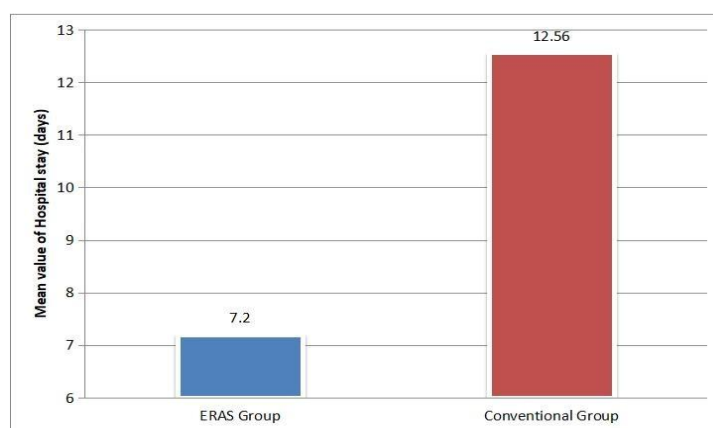


Table 6: comparison of mean duration of hospital stay between the both groups

DISCUSSION

The present study evaluated the impact of Enhanced Recovery After Surgery (ERAS) protocols on postoperative outcomes in elderly patients undergoing emergency laparotomy for hollow viscus perforation peritonitis. The findings demonstrated that the implementation of ERAS principles was associated with improved postoperative recovery, particularly in terms of reduced duration of hospital stay compared with conventional perioperative care.

A shorter hospital stay observed in patients managed under the ERAS protocol suggests that structured perioperative pathways can facilitate faster postoperative recovery even in emergency surgical settings. Early mobilization, early enteral nutrition, optimized fluid therapy, and multimodal analgesia are key components of ERAS that collectively reduce surgical stress and enhance physiological recovery. These interventions may contribute to improved gastrointestinal function, reduced postoperative complications, and earlier discharge from the hospital.

The findings of this study are consistent with previous research evaluating ERAS protocols in gastrointestinal surgery. Studies by Forsmo S and colleagues demonstrated that ERAS pathways significantly reduce postoperative hospital stay and improve recovery following colorectal surgery. Similarly, a systematic review conducted by Varadhan KK reported that ERAS protocols were associated with shorter hospitalization and reduced postoperative complications when compared with conventional perioperative care.

Although ERAS protocols were originally designed for elective surgical procedures, recent studies have explored their application in emergency surgery. Several ERAS components, such as optimized analgesia, early feeding, and early mobilization, can be safely implemented even in urgent clinical settings. The results of the present study support the feasibility of adopting selected ERAS principles in emergency gastrointestinal surgery, particularly in elderly patients who are at higher risk of postoperative complications.

In addition to improving clinical outcomes, ERAS protocols may also contribute to more efficient utilization of healthcare resources. Reduced hospital stay decreases the burden on hospital infrastructure and allows more efficient use of surgical beds and postoperative care facilities. This aspect is particularly relevant in resource-limited healthcare systems where hospital capacity is often constrained.

Despite these promising findings, certain limitations of the present study should be acknowledged. The sample size was relatively small, which may limit the generalizability of the results. In addition, the study was conducted at a single tertiary care center, and the follow-up period was limited to the postoperative hospital stay. Future multicenter studies with larger patient populations and longer follow-up periods are required to further validate these findings and to better define the role of ERAS protocols in emergency gastrointestinal surgery.

CONCLUSION

The present study suggests that the implementation of Enhanced Recovery After Surgery protocols in elderly patients undergoing emergency laparotomy for hollow viscus perforation peritonitis is feasible and associated with improved postoperative recovery. Patients managed under ERAS pathways experienced a significantly shorter duration of hospital stay compared with those receiving conventional perioperative care.

These findings indicate that selected ERAS components can be safely integrated into emergency surgical practice and may contribute to improved clinical outcomes and more efficient use of healthcare resources. However, larger multicenter studies are required to further confirm these observations and to establish standardized ERAS pathways for emergency gastrointestinal surgery.

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