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Original Research Article

OUTCOMES OF ENHANCED RECOVERY AFTER SURGERY (ERAS) IN MAJOR INCISIONAL HERNIA REPAIR: AN AMBIDIRECTIONAL OBSERVATIONAL STUDY

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ABSTRACT

Background: Incisional hernia repair is associated with significant postoperative morbidity, prolonged recovery, and extended hospital stay. Enhanced Recovery After Surgery (ERAS) protocols aim to attenuate surgical stress and accelerate recovery through evidence-based, multimodal perioperative care. However, data evaluating ERAS in major incisional hernia repair remain limited, particularly from real-world clinical settings. This study was designed to assess the impact of an ERAS protocol on postoperative recovery, complications, and length of hospital stay in patients undergoing major incisional hernia repair.

Materials and Methods: This ambidirectional observational study included 64 adult patients undergoing elective major incisional hernia repair at a tertiary care center. Thirty-two patients managed with conventional perioperative care formed the retrospective cohort, while 32 patients managed under a standardized ERAS protocol constituted the prospective cohort. Demographic variables, operative details, postoperative recovery parameters, complication rates, readmission, and early recurrence were analysed. Statistical comparisons were performed using appropriate parametric and non-parametric tests, with a p-value <0.05 considered significant.

Results: Baseline demographic and clinical characteristics were comparable between the two groups. The ERAS group demonstrated significantly earlier oral intake (11.8±3.2 vs 28.6±6.4 hours), earlier ambulation (18.9±4.6 vs 36.4±8.1 hours), and lower postoperative pain scores at 24 hours (VAS 3.4±1.0 vs 5.6±1.2) compared to the conventional care group (p<0.001). The mean length of hospital stay was significantly reduced in the ERAS group (4.1±1.2 vs 7.2±1.8 days; p<0.001). Postoperative complication rates, readmission, and early recurrence were lower in the ERAS group but did not differ significantly.

Conclusion: Implementation of an ERAS protocol in major incisional hernia repair significantly improves postoperative recovery and reduces hospital stay without increasing complications, supporting its safe and effective adoption in abdominal wall surgery.

Keywords: Enhanced Recovery After Surgery, Incisional hernia, Abdominal wall reconstruction, Postoperative recovery, Duration of hospital stay.

INTRODUCTION

Incisional hernia remains a common and challenging complication following abdominal surgery, with reported incidence ranging from 10% to 20% after midline laparotomies, depending on patient-related and procedural risk factors.[1] Large or recurrent incisional hernias are associated with significant morbidity, impaired quality of life, chronic pain, and increased healthcare costs. Surgical repair of major incisional hernias often requires extensive dissection, mesh implantation, and prolonged operative time,

predisposing patients to postoperative pain, ileus, wound complications, and extended hospital stay.[2] Optimizing perioperative care is therefore critical to improving outcomes in this complex surgical population.

Enhanced Recovery After Surgery (ERAS) represents a multimodal, evidence-based approach designed to attenuate surgical stress, maintain physiological function, and accelerate postoperative recovery. ERAS pathways integrate patient education, preoperative optimization, standardized anesthetic techniques, multimodal opioid-sparing analgesia, goal-directed fluid therapy, early enteral nutrition, and early mobilization.[3] Originally developed for colorectal surgery, ERAS principles have since been successfully adapted to multiple surgical specialties, including hepatobiliary, gynaecological, urological, and upper gastrointestinal procedures.[4]

The application of ERAS to abdominal wall and incisional hernia surgery is relatively recent but increasingly supported by emerging evidence. Studies evaluating ERAS protocols in ventral and incisional hernia repair have demonstrated reductions in postoperative length of stay, earlier return of bowel function, improved pain control, and reduced opioid consumption, without an associated increase in surgical site infections, readmissions, or early recurrence.[5,6] Given the high prevalence of comorbidities such as obesity, diabetes mellitus, and prior abdominal operations among patients with incisional hernias, ERAS-based perioperative optimization may be particularly beneficial in this group.[7]

Despite promising results, data on ERAS outcomes in major incisional hernia repair remain limited, especially from low- and middle-income healthcare settings, and most available studies are retrospective with heterogeneous protocols and outcome measures.[6,8] Furthermore, comparative real-world data evaluating conventional perioperative care versus structured ERAS pathways are scarce.

The present ambidirectional observational study was therefore undertaken to evaluate the impact of an ERAS protocol on postoperative recovery, complication rates, and length of hospital stay in patients undergoing major incisional hernia repair at a tertiary care center.

MATERIALS AND METHODS

This ambidirectional observational study was conducted in Department of General Surgery at Kamineni Institute of Medical Sciences, Narketpally from August 2024 to October 2025. A total sample size of 64 adult patients undergoing elective major incisional hernia repair, with equal consideration given to both retrospective and prospective cohorts, depending on case availability during the study period. The retrospective arm included patients who had already undergone major incisional hernia repair before formal implementation of the Enhanced Recovery After Surgery (ERAS) protocol, while the prospective arm included patients managed after standardized ERAS implementation. The study aimed to evaluate perioperative outcomes associated with ERAS in major incisional hernia repair.

Inclusion Criteria

Cases aged ≥18 years, diagnosed with major incisional hernia, cases undergoing elective open incisional hernia repair, cases with complete medical records for retrospective arm and willing to participate and provide informed consent.

Exclusion Criteria

Emergency incisional hernia repairs, strangulated hernias requiring bowel resection, ASA grade IV or above, pregnancy, cases with incomplete perioperative data and not willing to participate.

The written informed consent was obtained from all the participants. And study protocol was approved by the institutional ethics committee.

ERAS Protocol: The ERAS protocol was developed based on internationally accepted ERAS society guidelines and adapted to institutional practice. This included preoperative counselling, avoidance of prolonged fasting with carbohydrate loading, standardized multimodal opioid-sparing anesthesia, goal-directed fluid therapy, maintenance of normothermia, early oral feeding, early mobilization, and early removal of tubes and drains. Patients managed before ERAS implementation formed the conventional care group.

Data Collection: Data were collected using a structured proforma. For the retrospective arm, data were obtained from medical records, operative notes, and discharge summaries. For the prospective arm, data were collected in real time during hospital stay and follow-up visits. Collected variables including demographic details, comorbidities, hernia characteristics, operative details and postoperative outcomes.

Primary outcomes were postoperative length of hospital stay and complication rates. Secondary outcomes included time to oral intake, ambulation, postoperative pain scores, 30-day readmission, and hernia recurrence.

Patients were followed up at regular intervals in the outpatient department (at 2 weeks, 1 month, and 3-6 months postoperatively) to assess wound status, complications, and recurrence.

Statistical Analysis: The collected data was analysed by using SPSS v.26.0. Continuous variables were expressed as mean and standard deviation. Categorical variables were expressed as frequencies and percentages. Continuous variables were compared using Student's t-test as appropriate and categorical variables were compared using Chi-square test. A p-value <0.05 was considered statistically significant.

RESULTS

Table 1: Socio demographic and clinical characteristics of study participants.

Variable	Conventional Care (n=32)	ERAS Group (n=32)	p-value
Age (years),	52.4 ± 10.6	50.9 ± 11.2	0.56
Gender			
Male	19 (59.4%)	18 (56.2%)	0.79
Female	13 (40.6%)	14 (43.4%)	
BMI (kg/m²)	26.8 ± 3.4	26.1 ± 3.2	0.38
ASA grade			
Grade I & II	23 (71.9%)	24 (75.0%)	0.78
Grade III	9 (28.1%)	8 (25.0%)	0.78
Associate conditions			
Diabetes mellitus	14 (43.8%)	13 (40.6%)	0.80
Hypertension	16 (50.0%)	15 (46.9%)	0.81
COPD	6 (18.8%)	5 (15.6%)	0.74

Table 2: Hernia profile and intraoperative details.

Parameter	Conventional Care	ERAS Group	p-value
Mean defect size (cm)	7.4 ± 1.8	7.2 ± 1.6	0.63
Recurrent hernia	9 (28.1%)	8 (25.0%)	0.78
Duration of surgery (min)	112 ± 24	108 ± 22	0.49
Mesh position			
Sublay	21 (65.6%)	22 (68.8%)	0.79
Onlay	11 (34.4%)	10 (31.2%)	
Drain used	28 (87.5%)	26 (81.3%)	0.49
Intraoperative complications	2 (6.3%)	1 (3.1%)	0.55

Table 3: Early postoperative recovery outcomes

Outcome	Conventional Care	ERAS Group	p-value
Time to first oral intake (hours)	28.6 ± 6.4	11.8 ± 3.2	<0.001
Time to ambulation (hours)	36.4 ± 8.1	18.9 ± 4.6	<0.001
Time to urinary catheter removal (hours)	48.2 ± 12.5	24.6 ± 8.4	<0.001
Drain removal (days)	4.1 ± 1.3	2.3 ± 0.9	<0.001

Table 4: Postoperative pain scores (VAS)

Time Point	Conventional Care	ERAS Group	p-value
12 hours	6.1 ± 1.1	4.0 ± 1.0	<0.001
24 hours	5.6 ± 1.2	3.4 ± 1.0	<0.001
48 hours	4.3 ± 1.0	2.6 ± 0.9	<0.001

Table 5: Length of Hospital Stay

Group	Mean ± SD	Median (IQR)
Conventional Care	7.2 ± 1.8	7 (6–8)
ERAS Group	4.1 ± 1.2	4 (3–5)
p-value	<0.001	

Table 6: Follow-up Outcomes.

Outcome	Conventional Care	ERAS Group	p-value
30-day readmission	4 (12.5%)	1 (3.1%)	0.16
Hernia recurrence (≤6 months)	2 (6.3%)	1 (3.1%)	0.55

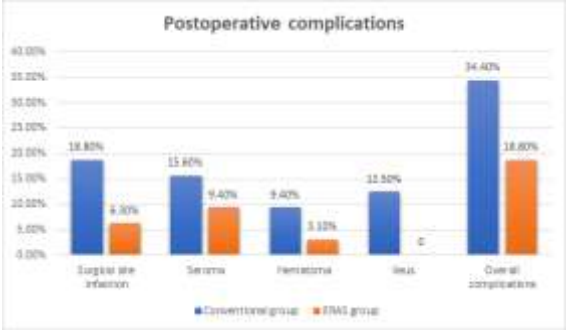

Figure 1: Postoperative Complications

DISCUSSION

This ambidirectional observational study demonstrates that implementation of an ERAS pathway for major incisional hernia repair was associated with earlier oral intake and ambulation, lower early postoperative pain scores, and a significantly shorter hospital stay without an apparent increase in 30-day readmission or early recurrence. These findings align with and extend prior literature showing that ERAS principles can be safely applied to abdominal wall surgery and are effective at improving functional recovery and reducing length of stay (LOS). A systematic review and meta-analysis of ERAS in abdominal wall reconstruction reported a statistically significant reduction in LOS (mean reduction ≈0.9 days) and found no increase in readmission or surgical-site events when ERAS pathways were used.[9] Similarly, narrative reviews and smaller cohort studies in incisional and ventral hernia populations reported shorter LOS, earlier

return to oral intake and mobilization, and comparable complication rates after ERAS adoption.[10,11]

Several reasons explain why ERAS produces these consistent benefits. ERAS is a multimodal, evidence-based bundle that targets physiologic stress (multimodal analgesia, opioid-sparing anesthesia, fluid optimization, normothermia), preserves metabolic reserve (carbohydrate loading, early oral nutrition), and accelerates functional recovery (early mobilization, early removal of drains/catheters).[11] In complex abdominal wall patients who frequently carry comorbidities such as obesity, diabetes and prior repairs preoperative optimization is emphasised in modern ERAS adaptations and is likely a key contributor to improved outcomes in this population.[10] Our results showing reduced time to first feed and ambulation and lower VAS scores at 12-48 hours therefore mirror the expected mechanistic effects of the ERAS bundle.

Safety is a central concern when accelerating postoperative pathways after major reconstructive procedures. The meta-analytic evidence and several cohort studies have not demonstrated a signal for increased surgical-site infection, surgical-site occurrence, readmission or reoperation after ERAS for abdominal wall reconstruction, supporting the safety of protocolized accelerated recovery when applied carefully.[9] Our cohort likewise showed no statistically significant increase in SSI, ileus, or readmissions; overall complication frequency was numerically lower in the ERAS arm. These observations suggest that ERAS does not trade faster discharge for higher morbidity, provided perioperative care is multidisciplinary and protocol adherence is good.

Despite encouraging consistency in functional outcomes, important limitations of the current evidence base and of our study must be acknowledged. Most published analyses in hernia and abdominal wall reconstruction are observational, often retrospective, with variable protocol content and heterogeneous outcome definitions; randomized data are scarce.[10,12] A systematic review of outcome reporting in incisional hernia surgery highlighted wide heterogeneity in which outcomes are reported and how they are defined, and under-reporting of patient-reported outcomes and long-term recurrence metrics.[8] Heterogeneous endpoints and variable follow-up complicate comparisons and pooled estimates, and they constrain strong causal inferences from observational series. Our ambidirectional design (retrospective historical controls vs prospective ERAS cohort) improves feasibility and ecological validity, but residual confounding and selection bias (changes in case-mix, surgeon experience, or institutional practices over time) cannot be fully excluded.

Another practical challenge is protocol fidelity. ERAS is a bundle; individual elements may vary between centres and even between patients. Studies suggest a dose response relationship higher ERAS compliance predicts better outcomes so accurate reporting of adherence is important for interpreting results and for reproducibility.[11] We implemented a standard ERAS checklist adapted to our setting, but the observational nature of the study and relatively small sample (n=64) limit formal subgroup or per-protocol analyses that could identify which elements contributed most to benefit.

Implications for practice and research follow directly. Clinically, the accumulating observational evidence including our cohort supports broader adoption of ERAS principles for elective major incisional hernia repair, with emphasis on prehabilitation for high-risk patients, standardized multimodal analgesia, goal-directed fluids and early mobilisation to shorten LOS and improve early recovery without increasing early complications. Operationally, successful ERAS adoption requires multidisciplinary engagement (surgery, anesthesia, nursing, physiotherapy, nutrition) and measurement systems to monitor adherence and outcomes. For research, there is an urgent need for larger multicentre prospective cohorts and randomized trials where feasible, standardized core outcome sets for incisional hernia (including patient-reported outcomes and standardized recurrence definitions), and studies that report ERAS adherence and cost-effectiveness alongside clinical outcomes.[8] Long-term follow-up is particularly important in hernia surgery because recurrence and functional outcomes often evolve beyond the immediate postoperative window.

Limitations of our work should temper interpretation: the modest sample size limits precision for rare events (major complications, recurrence), the ambidirectional design introduces potential temporal confounding, and follow-up of six months may miss later recurrences. Nevertheless, our findings add pragmatic, real-world support to the growing literature that ERAS pathways improve early recovery and shorten hospital stays in abdominal wall surgery without compromising short-term safety.[9-12]

CONCLUSION

In conclusion, in this single-center ambidirectional study ERAS implementation for major incisional hernia repair improved early recovery metrics and reduced LOS while preserving safety. These results, consistent with systematic reviews and contemporary observational series, support adoption of ERAS principles for abdominal wall surgery while underscoring the need for standardized outcome reporting and larger prospective studies to refine best practices and confirm long-term benefits.

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