RESEARCH PAPER

Postoperative Recovery Outcomes Following Implementation of Enhanced Recovery After Surgery (ERAS) Protocols in Elective Inguinal Hernia Repair: A Retrospective Observational Study

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ABSTRACT

Introduction: Although Enhanced Recovery After Surgery (ERAS) has been proven to be effective for major abdominal surgeries, its effects in Inguinal Hernia Repairs are not completely understood. This study examines patient outcomes after receiving elective inguinal hernia repair using ERAS-based perioperative care.

Methods: This was a retrospective observational study that included 40 patients who were 18-65 years of age and had an ASA classification of I-III. All patients underwent elective open or laparoscopic inguinal hernia repair using ERAS protocols at a tertiary care teaching hospital. ERAS protocols for inguinal hernia repairs included preoperative education, no fasting, multimodal analgesia, early diet, early ambulation, and standardised discharge planning. Postoperative data collected from medical records included VAS pain scores, time to first ambulate, time to resume diet, length of stay, and complications for the first 30 days after surgery.

Results: The mean for first ambulation was 4.8 ± 1.2 hours, and the mean for resuming a diet was 2.4 ± 0.8 hours. The mean length of stay was 28.4 ± 10.6 hours, with 67.5% of patients discharged <24 hours. Pain was well controlled (VAS ≤ 3 in 85% at 24 hours postoperatively). The overall complication rate was 12.5%, with two (5%) urinary retentions, two (5%) seromas, and one (2.5%) superficial surgical site infection. No patients were readmitted within 30 days or died following this surgery.

Conclusion: Routine implementation of ERAS principles for inguinal hernia repairs allowed for delayed ambulation, early resuming of diet, short lengths of stay, and a low complication rate. These results support broader implementation of ERAS standards for hernia repair performed as an outpatient procedure.

Keywords: Enhanced recovery after surgery; inguinal hernia; herniorrhaphy; perioperative care; length of stay; postoperative pain

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INTRODUCTION

Inguinal hernia repair is one of the most commonly performed elective surgeries worldwide, and makes up a large share of general surgical work both in community practices and tertiary general hospitals. The development of surgical techniques—from traditional tissue repair to tension-free mesh repair, and now to laparoscopic approaches—has improved the outcomes of these operations through decreased recurrence rates and less invasive approaches [1]. Even with these advancements, there remains considerable variation in perioperative care practices and it is possible this variability significantly affects the clinically important outcomes associated with inguinal hernia repairs, including postoperative pain, time to return to function, length of stay, and patient satisfaction. While the traditional perioperative pathway for inguinal hernia repairs has included prolonged preoperative fasting, delayed resumption of oral intake, opioid-based opioid-based pharmacologic pain control regimens, and conservative protocols for mobilization, many of these pathways are based on traditional surgical practices and have little scientific justification. Traditional practices may be inadvertently associated with prolonged recovery and increased consumption of healthcare resources without any corresponding benefit to patient safety [2].

Enhanced Recovery After Surgery (ERAS) represents a new paradigm in perioperative medicine—a multimodal, evidence-based pathway designed to decrease the surgical stress response, promote the maintenance of physiologic homeostasis, and accelerate a return to baseline functioning [3]. Developed and validated primarily in colorectal surgery, ERAS protocols have consistently shown a decrease in postoperative morbidity, length of stay, and overall healthcare costs with no increase in patient safety [4]. Core components of ERAS include; patient education and counselling prior to surgery, avoidance of preoperative fasting through carbohydrate loading; multimodal analgesic regimen to minimize the use of opioids; maintenance of normothermia and euvolemia during the perioperative period; providing early postoperative nutrition; and structured mobilization goals with clear discharge goals.

The application of Enhanced Recovery After Surgery principles to inguinal hernia surgery is a natural extension

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of this model. Hernia procedures are amenable to both ambulatory and fast-track recovery models. While the published literature related to the application of ERAS elements in inguinal hernia surgery is limited, several hospitals are implementing ERAS into their normal practice with regard to the care of patients undergoing inguinal hernia surgery [5]. Considerably of the existing literature focused on isolated elements of the ERAS model or have performed in highly screened research populations that may not be representative of routine practice.

This retrospective observational study was therefore undertaken to characterise postoperative recovery outcomes in patients undergoing elective inguinal hernia repair managed with ERAS-based perioperative care as part of routine clinical practice. By analysing existing medical records from a tertiary care teaching hospital, we sought to provide clinically relevant data on pain control, functional recovery milestones, duration of hospitalisation, and short-term safety outcomes following implementation of ERAS principles in this common surgical procedure.

OBJECTIVES

Primary Objective:

To evaluate postoperative recovery outcomes in patients undergoing elective inguinal hernia repair managed with ERAS-based perioperative care.

Secondary Objectives:

To assess postoperative pain levels as documented in medical records using the Visual Analogue Scale (VAS).

To determine time to first ambulation and time to resumption of oral intake.

To analyse length of hospital stay and proportion of patients achieving discharge within 24 hours.

To document early postoperative complications and short-term safety outcomes up to 30 days post-surgery.

MATERIALS AND METHODS

Study Design and Setting

This retrospective observational study was conducted in the Department of General Surgery at a tertiary care teaching hospital following approval from the Institutional Human Ethics Committee (IHEC). Given the retrospective design involving secondary use of existing clinical data without direct patient contact, a waiver of informed consent was obtained from the ethics committee. The study is reported in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for observational research.

Study Population

Consecutive adult patients who underwent elective inguinal hernia repair between January 2025 and January 2026 and received ERAS-based perioperative management as part of routine clinical care were screened for eligibility. ERAS principles had been implemented in the department as a standard perioperative pathway prior to the study period, based on contemporary guidelines and local multidisciplinary consensus.

Inclusion criteria were: (i) age ≥18 years and ≤65 years; (ii) primary, uncomplicated inguinal hernia (Nyhus type I–III); (iii) elective open tension-free mesh repair or laparoscopic (TEP/TAPP) inguinal hernia repair; (iv) American Society of Anesthesiologists (ASA) physical status classification I–III; and (v) availability of complete perioperative and postoperative medical records, including anaesthetic charts, nursing notes, medication records, and discharge summaries.

Exclusion criteria comprised: (i) complicated inguinal hernias (obstructed, strangulated, or incarcerated); (ii) recurrent inguinal hernia; (iii) emergency surgical procedures; (iv) patients requiring concomitant surgical procedures; and (v) incomplete or inadequate medical records precluding accurate data extraction.

ERAS-Based Perioperative Care Protocol

Every patient and document encompassed in ERAS program were managed as per routine department of surgery clinical record keeping practices showing all ERAS based phases with clear mention when documenting patient management observations: 1). Pre-operative: a) structured counselling with respect to peri-operative expectations regarding mobilising targets and criteria for discharge at Pre-Anaesthetic Clinic; b) allowed to drink clear fluids right up to 2 hours prior to anaesthesia induction and food until 6 hours before surgery; c) no standard mechanical bowel prep used; d) carbohydrate loaded 100g orally prior to surgery (2 hours) for those who do not have diabetes; 2). Intra-operative: a) anaesthetic method was at discretion of anaesthetist; methods used were consistent with the use of multimodal analgesia principles including: use of regional anaesthesia (spinal or through local infiltration), giving of paracetamol & NSAID's preoperatively in an attempt to limit the amount of narcotics needed to treat the patient's pain postoperatively; b) provisions made to help maintain normothermia (temperature of ≥36.0C) if necessary by the use of forced air warming device; c) maintenance of restrictive fluid therapy and compliance with goal directed therapy based on patient's hemodynamics during surgical procedure; d) type of surgical procedure performed (either open tension-free mesh repair (Lichtenstein) or laparoscopic repair (TAPP or TEP)) determined largely by surgeon preference but also on anatomic criteria based on findings during surgery with documentation of criteria found; 3). Post-operative: a) initiation of oral intake after 2 hours following surgery - initiating with clear fluids and changing to regular diet as tolerated; b) Mobility encouraged within 4-6 hours post surgery with physiotherapy staff assisting in mobility efforts; c) continue to use of multimodal analgesia therapy for at least 7 days following discharge from hospital, such as giving of regular doses of paracetamol and NSAID's with the use of narcotics as a last resort; 4). Urinary catheters, when inserted, to be taken out by 6 hours after surgery; 5) discharge planning started pre-operatively and consisted of meeting the following criteria to be eligible for discharge: adequate control of pain on an oral analgesic, ability to tolerate oral intake, independence when mobilising and free from having a surgical complication that requires an overnight stay in the hospital.

Data Collection and Parameters Recorded

Data were extracted from electronic and paper medical records by two independent investigators using a

standardised data collection form. Discrepancies were resolved through discussion or consultation with a third reviewer. The following parameters were recorded:

Demographic and baseline characteristics: Age, sex, body mass index (BMI), ASA classification, hernia type and laterality, surgical technique (open vs. laparoscopic; TAPP vs. TEP if applicable), and operative duration.

Postoperative pain: Pain scores assessed using the 10-point Visual Analogue Scale (VAS) at 6, 12, 24, and 48 hours postoperatively, as documented in nursing or medical records. The worst pain score at each time point was recorded.

Functional recovery parameters: Time to first ambulation (defined as hours from end of surgery to independent walking outside the patient's room, as documented in nursing notes); time to resumption of oral intake (hours to first oral fluid intake and to solid food tolerance).

Length of hospital stay: Total duration from postoperative recovery unit admission to formal discharge from the hospital, recorded in hours. Proportion of patients discharged within 24 hours was also calculated.

Postoperative complications: Any adverse events occurring within 30 days of surgery, as documented in inpatient records or outpatient follow-up notes. Complications of interest included surgical site infection (superficial or deep), wound seroma or haematoma, urinary retention requiring catheterisation, scrotal oedema, and any unplanned readmission or reoperation.

Follow-up data up to 30 days postoperatively were reviewed where available in the records.

Sample Size Calculation

A convenience sample of 40 consecutive eligible patients meeting inclusion criteria during the study period was planned for inclusion. This sample size was considered adequate to provide descriptive estimates of recovery outcomes with reasonable precision, based on similar retrospective studies in the literature [6].

Statistical Analysis

Statistical analysis was performed using SPSS version 26.0 (IBM Corp., Armonk, NY). Continuous variables were expressed as mean ± standard deviation (SD) or median with interquartile range (IQR) depending on distribution normality, assessed using the Shapiro–Wilk test. Categorical variables were presented as frequencies and percentages. For subgroup comparisons between open and laparoscopic approaches, continuous variables were compared using independent samples t-test or Mann–Whitney U test as appropriate, and categorical variables using chi-square test or Fisher's exact test. A two-tailed p-value <0.05 was considered statistically significant.

RESULTS

Patient Demographics and Baseline Characteristics

A total of 47 patients who underwent elective inguinal hernia repair with ERAS-based management during the study period were screened. Seven patients were excluded due to incomplete medical records (n=4), recurrent hernia (n=2), or age >65 years (n=1), leaving 40 patients for final analysis.

The cohort comprised 37 males (92.5%) and 3 females (7.5%), with a mean age of 48.6±12.4 years (range 24–65 years). Mean BMI was 24.8±3.2 kg/m². ASA distribution was: class I, 18 patients (45.0%); class II, 17 patients (42.5%); and class III, 5 patients (12.5%). Right-sided hernias were more common (n=24, 60.0%) than left-sided (n=16, 40.0%). Twenty-three patients (57.5%) underwent open Lichtenstein repair, while 17 patients (42.5%) underwent laparoscopic repair (TAPP in 11, TEP in 6). Mean operative duration was 58.4±14.6 minutes for open repairs and 72.8±18.3 minutes for laparoscopic repairs.

Table 1. Baseline Demographic and Clinical Characteristics of the Study Population (N=40)

Characteristic	Value
Age (years), mean ± SD	48.6 ± 12.4
Sex, n (%)	
Male	37 (92.5)
Female	3 (7.5)
BMI (kg/m²), mean ± SD	24.8 ± 3.2
ASA classification, n (%)	
I	18 (45.0)
II	17 (42.5)
III	5 (12.5)
Hernia laterality, n (%)	
Right	24 (60.0)
Left	16 (40.0)
Surgical technique, n (%)	
Open Lichtenstein	23 (57.5)
Laparoscopic (total)	17 (42.5)
TAPP	11 (27.5)
TEP	6 (15.0)
Operative duration (min), mean ± SD	
Open repair	58.4 ± 14.6
Laparoscopic repair	72.8 ± 18.3

Postoperative Pain Scores

Postoperative pain was generally well-controlled throughout the recovery period. Mean VAS scores were 3.6±1.2 at 6 hours, 2.8±1.1 at 12 hours, 2.1±0.9 at 24 hours, and 1.4±0.8 at 48 hours postoperatively. At 24 hours, 34 patients (85.0%) reported VAS ≤3, and no patient reported severe pain (VAS ≥7) beyond 12 hours. Patients undergoing laparoscopic repair reported slightly lower pain scores at all time points compared to open repair, although these differences did not reach statistical significance (at 24 hours: 1.9±0.8 vs. 2.3±1.0, p=0.18).

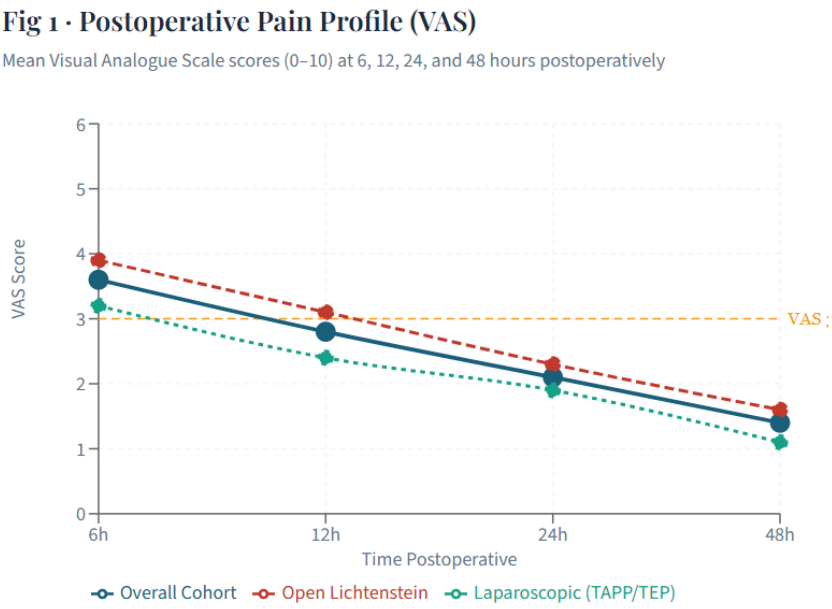

Figure 1. Postoperative pain profile following inguinal hernia repair with ERAS protocol. Line graph displaying mean Visual Analogue Scale (VAS) pain scores with standard deviation error bars at 6, 12, 24, and 48 hours postoperatively. Data are presented for the overall cohort and stratified by surgical approach (open versus laparoscopic repair). The graph demonstrates well-controlled pain across all time points, with a trend toward lower scores in the laparoscopic group

Functional Recovery Outcomes

The mean time to first ambulation was 4.8±1.2 hours overall. Thirty-two patients (80.0%) achieved ambulation within 6 hours of surgery. Patients in the laparoscopic group mobilised slightly earlier than those undergoing open repair (4.4±1.1 hours vs. 5.1±1.3 hours, p=0.08).

Resumption of oral intake occurred at a mean of 2.4±0.8 hours postoperatively, with 36 patients (90.0%) tolerating oral fluids within 4 hours. Tolerance of solid diet was achieved at a mean of 5.6±1.8 hours.

Table 2. Postoperative Recovery Outcomes

Outcome Parameter	All Patients (N=40)	Open Repair (n=23)	Laparoscopic Repair (n=17)	p-value
Time to first ambulation (hours), mean ± SD	4.8 ± 1.2	5.1 ± 1.3	4.4 ± 1.1	0.08
Ambulation ≤6 hours, n (%)	32 (80.0)	17 (73.9)	15 (88.2)	0.44
Time to oral intake (hours), mean ± SD	2.4 ± 0.8	2.5 ± 0.9	2.2 ± 0.7	0.25
Oral intake ≤4 hours, n (%)	36 (90.0)	20 (87.0)	16 (94.1)	0.62
Time to solid diet (hours), mean ± SD	5.6 ± 1.8	5.9 ± 2.0	5.2 ± 1.5	0.22
Length of hospital stay (hours), mean ± SD	28.4 ± 10.6	31.2 ± 11.4	24.6 ± 8.2	0.045
Discharge within 24 hours, n (%)	27 (67.5)	13 (56.5)	14 (82.4)	0.08

Length of Hospital Stay

The mean length of hospital stay for the entire cohort was 28.4±10.6 hours (median 24 hours, IQR 20–34 hours). Twenty-seven patients (67.5%) were discharged within 24 hours of surgery. Laparoscopic repair was associated with significantly shorter hospital stay compared to open repair (24.6±8.2 hours vs. 31.2±11.4 hours, p=0.045). The proportion of patients achieving discharge within 24 hours was 82.4% in the laparoscopic group versus 56.5% in the open group (p=0.08).

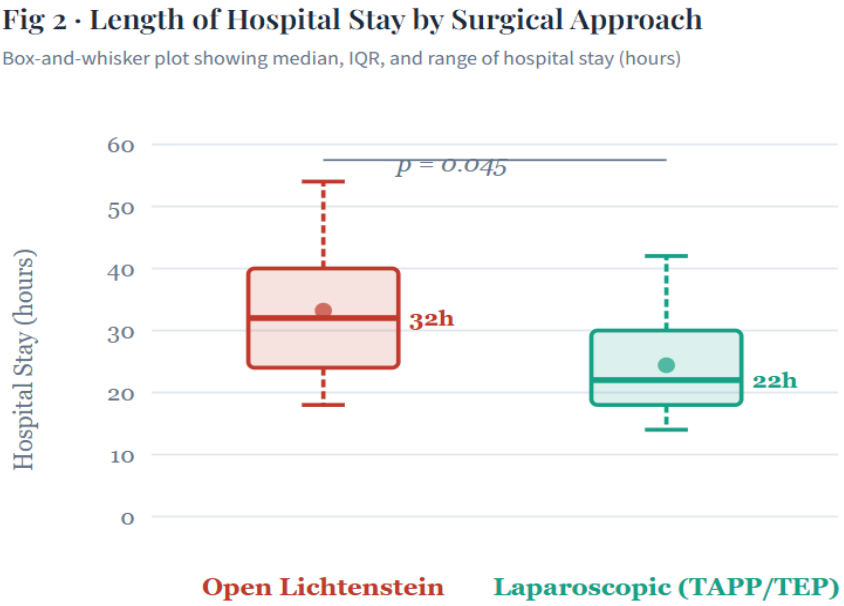

Figure 2. Length of hospital stay by surgical approach. Box-and-whisker plot comparing total hospital stay (hours) between patients undergoing open Lichtenstein repair and laparoscopic (TAPP/TEP) repair. The box represents the interquartile range (IQR), the horizontal line within the box indicates the median, and whiskers extend to the range excluding outliers. Individual data points are overlaid to show distribution. Laparoscopic repair was associated with significantly shorter hospitalisation (p=0.045).

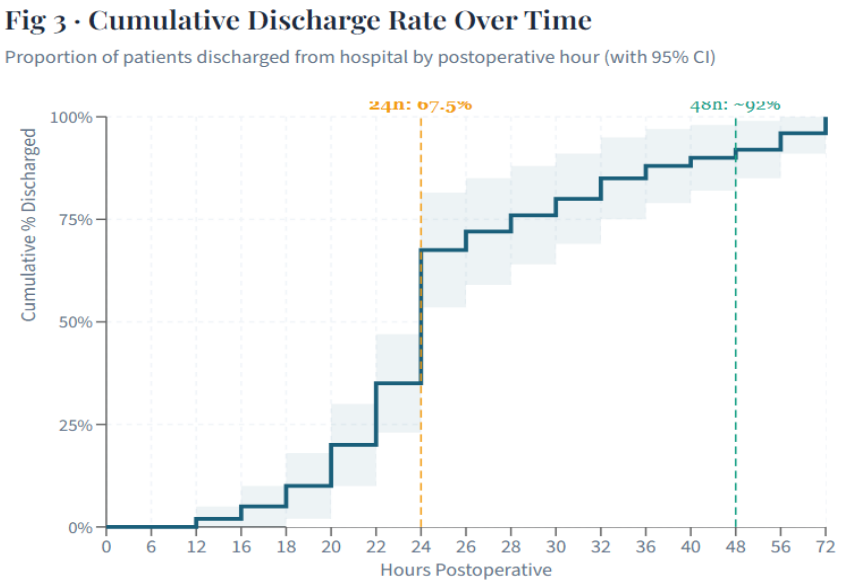

Figure 3. Cumulative proportion of patients achieving discharge over time. Kaplan–Meier-style curve showing the cumulative percentage of patients discharged from hospital as a function of postoperative hours. The curve illustrates the rapid discharge trajectory, with 67.5% of patients discharged within 24 hours and 90% within 48 hours. Shaded area represents 95% confidence interval

Postoperative Complications and Short-Term Outcomes

The overall complication rate within 30 days was 12.5% (5 patients). No mortality, unplanned readmissions, or reoperations occurred. Complications comprised: urinary retention requiring temporary catheterisation in two patients (5.0%), both following open repair; superficial wound seroma in two patients (5.0%), one in each group; and superficial surgical site infection in one patient (2.5%) in the open group, managed successfully with oral antibiotics without mesh explantation. No deep surgical site infections, haematomas requiring intervention, or cases of chronic pain were documented within the follow-up period. There were no significant differences in complication rates

between surgical approaches (open 13.0% vs. laparoscopic 11.8%, p=1.00).

Table 3. Postoperative Complications and 30-Day Outcomes

Complication/Outcome	All Patients (N=40)	Open Repair (n=23)	Laparoscopic Repair (n=17)	p-value
Overall complications, n (%)	5 (12.5)	3 (13.0)	2 (11.8)	1.00
Urinary retention	2 (5.0)	2 (8.7)	0	0.50
Wound seroma	2 (5.0)	1 (4.3)	1 (5.9)	1.00
Superficial SSI	1 (2.5)	1 (4.3)	0	1.00
Deep SSI	0	0	0	–
Haematoma	0	0	0	–
30-day readmission	0	0	0	–
Reoperation	0	0	0	–
Mortality	0	0	0	–

SSI, surgical site infection

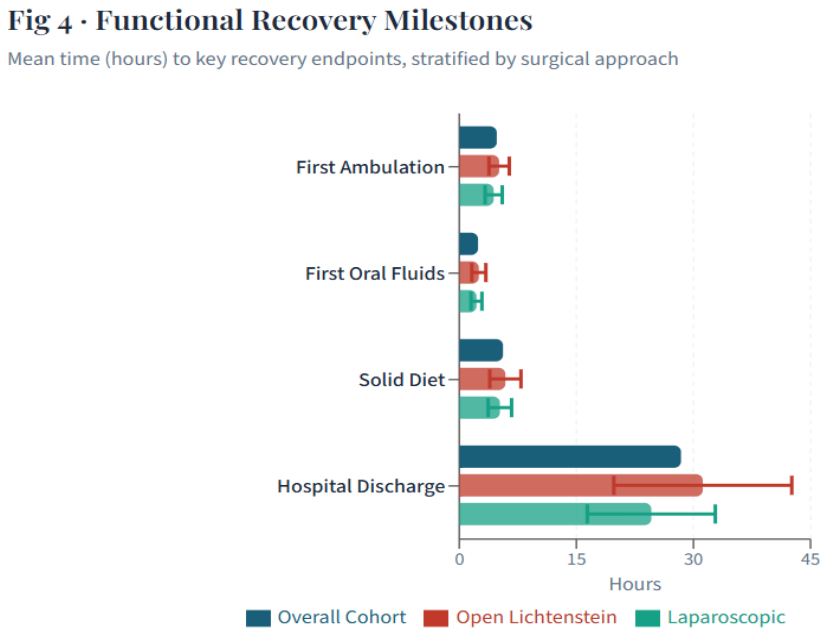

Figure 4. Functional recovery milestones. Horizontal bar chart depicting mean times to key recovery endpoints: first ambulation, resumption of oral fluids, tolerance of solid diet, and hospital discharge. Error bars represent standard deviations. The temporal sequence illustrates the rapid functional recovery enabled by ERAS protocols

DISCUSSION

Researchers conducted this retrospective observational research study to determine how well patients recover post-op and the differences in outcomes when undergoing elective inguinal hernia repair using ERAS-related perioperative guidelines versus using traditional methods of recovery in a routine clinical environment. Of the 40 patients included in this sample, those receiving ERAS principles had significantly improved postoperative outcomes (eg., mean time to mobilization [mean = 4.8 hours], mean time to begin taking fluids orally [mean = 2.4 hours], mean length of stay [mean = 28.4 hours; 67.5% discharged within 24 hours]), controlled pain following surgery, and overall low complication rates (12.5%) with no instances of major complications or deaths. These results are comparable to existing benchmarks for traditional postoperative treatments, thus providing an additional basis for applying ERAS principles as standard practice in out-of-hospital settings for patients undergoing hernia repairs.

The progression of care associated with the rehabilitation of inguinal hernias is aligned with the progression of surgical trends toward minimally invasive surgery and rapid recovery processes. Developments arising from Dr. Kehlet's original studies on multimodal rehabilitation revealed that the physiological stress response resulting from surgical intervention could be reduced with coordinated efforts aimed at multiple aspects of the perioperative process [3]. One method for coordinating these collaborative efforts was through the development of international guidelines outlining ERAS protocols, which enable healthcare practitioners to incorporate this methodology into numerous surgical procedures [4]. Our research adds to the substantial information already existing regarding the application of ERAS principles in the treatment of hernias (which further validates the application of ERAS in hernia repair as being applicable beyond the context of large abdominal surgery).

There are a number of factors within our findings warranting discussion.Time until first ambulatory was 4.8 hours overall; 80% of patients mobilised within 6 hours,

representing a dramatic improvement compared to traditional practice where mobilisation was routinely delayed until the next day. The physiologic advantages of early mobilisation are broader than just expediency. Reduced venous stasis lessens risk of thromboembolic events, maintenance of skeletal muscle function preserves strength and aid in resuming normal activities, and the psychological impact of being able to function independently early may improve satisfaction [7]. Laparoscopic patients exhibited slightly earlier mobilisation (4.4 vs 5.1 hours), probably due to less parietal trauma and postoperative pain; this difference was not statistically significant with our small sample size.

The resumption of oral intake occurred at a similarly rapid pace, with 90% of patients tolerating fluids within 4 hours. The clinical rationale behind delaying oral intake until either ileus has resolved or bowel sounds return after groin hernia repair is not supported by physiology. In this patient population, intestinal manipulation is minimal and postoperative ileus is rarely observed. Early access to oral nutrition supports gut barrier function, decreases insulin resistance, and enhances patient comfort without increasing the incidence of nausea or vomiting when used with modern anaesthetic techniques (prophylactic antiemetics and opioid-sparing analgesia) [8].

The length of stay following surgery recorded in this study was an average of 28.4 hours, with 66% of patients discharged within 24 hours of surgery. Our results correspond to those from dedicated hernia centres and day-case units from around the world.Importantly, this was done without compromising safety to patients evidenced by the low complication rate/readmissions. The shorter hospital stay for laparoscopic patients (24.6 hours vs. 31.2 hours, $p = 0.045$) is consistent with earlier studies comparing recovery following minimally invasive repairs [9]. Open repair patients also had an early discharge rate (56.5%) in a systematic application of ERAS principles for both surgery types.

Postoperative pain management is a critical factor determining both recovery and readiness for discharge. Our protocol included multimodal, opioid-sparing analgesia, covering regional techniques along with regularly provided acetaminophen, NSAIDs and opioids for breakthrough pain. Eighty-five percent of patients had VAS scores ≤ 3 24 hours post-op with this protocol. This is superior to previously reported series of primarily opioid-based analgesia where pain control is achieved at the expense of side effects related to opioid therapy, such as sedation, nausea, constipation and delayed ambulation [10]. Focus on minimising perioperative exposure to opioid pain relief through the opioid epidemic, our data substantiate the ability to maintain reasonable quality analgesia in this level of care through non-opioid analgesics.

The overall complication rate of 12.5% is within expected numbers for elective inguinal hernia repairs when compared to published benchmarks. The complications seen in this series with urinary retention (5.0%), seroma (5.0%) and superficial surgical site infection (2.5%) have all been documented. Urinary retention has been associated with groin surgical repair and is seen primarily in men, older individuals, and those utilising spinal anaesthesia or significant intraoperative fluids [11]. The protocol's focus on restrictive fluid management and early ambulation was likely contributing factors in achieving a relatively low rate of urinary retention in this study. The absence of mesh infection, chronic pain, or recurrence rates during the limited follow-up period is reassuring, yet confirmation from larger studies with longer-term follow-up is required.

The present study contributes to a small but growing literature examining ERAS application in inguinal hernia surgery. Zhu and colleagues recently reported outcomes of a laparoscopic-enhanced recovery protocol for incarcerated inguinal hernia in 200 patients, demonstrating significantly reduced complications (9% vs. 38%), shorter hospital stays (3.1 vs. 5.6 days), and accelerated bowel function recovery compared to conventional open surgery [12]. While their study addressed the distinct population of emergency hernia patients—a higher-risk group with different physiological considerations—the consistent direction of benefit supports ERAS principles across the hernia spectrum.

In the elective setting, Li and colleagues investigated ERAS application in elderly patients undergoing inguinal hernia repair, randomising 150 patients to ERAS-based versus conventional nursing care [13]. Their findings parallel ours: the ERAS group demonstrated significantly lower VAS pain scores at all postoperative time points, shorter time to first ambulation and bowel sound recovery, reduced hospital stay, and lower complication rates. The consistency of these observations across different healthcare systems and patient populations strengthens the evidence base for ERAS implementation.

Hootsmans and colleagues examined ERAS outcomes in outpatient minimally invasive GI and hernia surgery, focusing particularly on opioid consumption [14]. Their prospective series demonstrated that ERAS implementation significantly reduced perioperative opioid use while maintaining adequate analgesia and facilitating early discharge—findings that align with our opioid-sparing approach and its successful outcomes.

The Eastern Association for the Surgery of Trauma (EAST) recently published a systematic review and meta-analysis addressing surgical management of incarcerated and strangulated inguinal hernias, conditionally recommending laparoscopic approaches over open repair based on reduced recurrence and shorter hospital stay [15,16]. While their guideline focused on emergency presentations, the underlying principle—that minimally invasive techniques confer recovery advantages—extends logically to elective repair and complements ERAS-based perioperative care.

A noteworthy finding from Song and colleagues' paediatric hernia study was that ERAS principles benefited even young children, with reduced time to ambulation, earlier return to bowel function, and shorter hospital stays compared to routine care [17]. Although our adult population differs in important respects, the consistency of ERAS benefits across age groups suggests fundamental physiological mechanisms that transcend developmental stage.

This study possesses several strengths. It reflects real-world clinical practice in a tertiary teaching hospital, enhancing

generalisability to similar settings. The ERAS protocol was implemented as routine care rather than a research intervention, eliminating the potential performance bias inherent in studies where staff are aware of being observed. Data extraction was systematic and followed a predefined protocol, with independent double-data extraction to minimise error. The inclusion of both open and laparoscopic techniques allows comparison of ERAS effects across surgical approaches.

However, several limitations must be acknowledged when interpreting our findings. The retrospective design introduces potential information bias, as we were limited to data documented in medical records. Pain scores, for example, were not recorded at uniform intervals for all patients, and some variability in documentation quality was inevitable. The absence of a control group precludes definitive attribution of observed outcomes to ERAS implementation rather than secular trends or other unmeasured factors. Our sample size, while adequate for descriptive purposes, limited statistical power for subgroup analyses and may have failed to detect clinically important differences between surgical approaches.

Selection bias is inherent in retrospective studies; although we applied consecutive sampling, the requirement for complete records may have excluded patients with complicated postoperative courses where documentation was prioritised differently. The single-centre design raises questions about reproducibility in other settings with different patient populations, surgical expertise, or organisational resources. Follow-up was limited to 30 days, preventing assessment of longer-term outcomes including chronic pain, recurrence, and patient-reported quality of life—outcomes of substantial importance in hernia surgery where the procedure aims to improve long-term well-being. Furthermore, our study did not include formal cost-effectiveness analysis. While shorter hospital stay and reduced complication rates would be expected to lower healthcare costs, the resources required for protocol implementation—including staff education, patient counselling materials, and coordinated multidisciplinary care—must be considered in any comprehensive evaluation. Future studies should incorporate health economic outcomes to inform resource allocation decisions.

Notwithstanding these limitations, our findings support the continued and expanded use of ERAS protocols in elective inguinal hernia repair. The observed outcomes—early mobilisation, rapid nutritional recovery, short hospital stay, effective pain control, and low complication rates—represent meaningful improvements over traditional perioperative care and align with patient priorities for rapid return to normal function. For surgeons and institutions contemplating ERAS implementation, our experience suggests that success depends less on sophisticated technology than on systematic attention to evidence-based perioperative details and multidisciplinary coordination.

Several questions remain for future investigation. Randomised controlled trials comparing comprehensive ERAS protocols to conventional care in inguinal hernia repair would provide higher-quality evidence, though such trials face challenges including contamination between groups and the difficulty of blinding. Comparative effectiveness research examining individual ERAS components could identify which elements contribute most to improved outcomes, potentially allowing streamlined protocols that preserve benefits while reducing implementation burden. Patient-reported outcome measures deserve greater attention, capturing domains such as return to work, resumption of physical activity, and satisfaction with the recovery experience that matter deeply to patients but are inadequately reflected in traditional clinical metrics.

The intersection of ERAS with emerging technologies presents additional research opportunities. Telemedicine and mobile health applications could extend ERAS principles into the preoperative and post-discharge phases, providing remote education, monitoring recovery progress, and identifying complications early [18]. Wearable activity trackers might enable objective measurement of mobilisation and physical recovery, complementing subjective patient reports. Integration of ERAS pathways with electronic health records could facilitate protocol adherence through decision support and automated data capture for quality improvement and research.

Finally, the application of ERAS principles to special populations—including elderly patients with frailty, those with significant comorbidities, and individuals undergoing bilateral or complex hernia repairs—requires further study. Our exclusion of recurrent and complicated hernias limits applicability to these higher-risk groups, who might derive particular benefit from optimised perioperative care but also present unique challenges requiring protocol adaptation.

CONCLUSIONS

Based on the findings from this retrospective observational study, it appears that implementing ERAS protocols during elective inguinal hernia surgery could significantly improve postoperative recovery times through early ambulation, early initiation of oral intake, shorter lengths of hospital stay, effective pain control, and a low rate of complications. Of those enrolled in the study, 66% of patients were discharged within 24 hours after surgery; there were no deaths reported due to surgical complications and there were very few cases of significant morbidity associated with ERAS. Patients who underwent laparoscopic repair had shorter length of stay than patients who underwent open repair; however, benefits were associated with ERAS regardless of surgical technique. These results demonstrate that there is a compelling reason to adopt the use of ERAS protocols in the outpatient setting for inguinal hernia surgery; additionally, future prospective studies should be conducted to determine if the outcomes achieved with ERAS are sustained over time, if costs associated with ERAS implementation are offset by improved patient outcomes, and how to streamline the processes associated with implementing ERAS. As the healthcare industry continues to move toward value-based reimbursement models, implementing ERAS protocols is an evidence-based way to enhance surgical quality and reduce resource use associated with surgical procedures.

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