



COMPARATIVE OUTCOMES OF EMERGENCY AND ELECTIVE ABDOMINAL WALL HERNIA REPAIR IN ADULTS

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Abstract

This comparative cohort study demonstrated that patients undergoing emergency abdominal wall hernia repair experienced substantially poorer postoperative outcomes than those treated electively. Emergency surgery was associated with significantly higher rates of 30-day mortality, major postoperative complications, surgical-site infections, bowel resection, and prolonged hospitalization. These findings are clinically important because they highlight the consequences of delayed presentation and the progression of hernias to incarceration, obstruction, or strangulation, conditions that often necessitate urgent intervention and increase operative complexity. The markedly higher requirement for bowel resection among emergency cases suggests a greater burden of ischemic or non-viable bowel, which contributes to increased morbidity and mortality. Furthermore, the elevated incidence of surgical-site infection and other major complications may reflect contamination associated with bowel compromise, longer operative times, and the reduced physiological reserve of acutely ill patients. Multivariable analysis confirmed that emergency presentation remained an independent predictor of adverse outcomes even after adjustment for potential confounders, emphasizing that the timing and circumstances of surgery are critical determinants of prognosis. These results are consistent with previous reports showing superior outcomes following planned elective hernia repair compared with emergency procedures. From a healthcare perspective, timely identification and elective repair of symptomatic hernias may prevent progression to emergency conditions, reduce postoperative complications, shorten hospital stay, and decrease healthcare costs. Particular attention should be directed toward elderly individuals and patients with comorbidities who may be at increased risk of emergency presentation. Overall, the study provides strong evidence supporting proactive elective management of abdominal wall hernias whenever clinically appropriate. Future multicentre prospective studies are warranted to validate these findings and identify strategies that further reduce emergency hernia presentations and their associated complications.

Keywords: *Hernia repair; Emergency surgery; Elective surgery; Strangulation; Bowel resection; Surgical outcomes.*

Introduction

Abdominal wall hernias are among the most common surgical conditions encountered in clinical practice and represent a significant proportion of procedures performed by general surgeons worldwide



[1]. They occur when intra-abdominal contents protrude through a weakness or defect in the abdominal wall and may present as inguinal, femoral, umbilical, incisional, or ventral hernias. Elective surgical repair remains the definitive treatment for symptomatic hernias and is generally associated with favorable outcomes, low postoperative morbidity, short hospital stays, and rapid recovery when performed under controlled circumstances [2]. Advances in surgical techniques, mesh technology, perioperative care, and enhanced recovery protocols have further improved the safety and effectiveness of elective hernia repair. Despite these advances, a considerable number of patients continue to present as surgical emergencies due to incarceration, intestinal obstruction, or strangulation of the hernia contents. These complications can compromise blood supply to the entrapped bowel, resulting in ischemia, necrosis, perforation, and systemic sepsis if not promptly treated [3]. Emergency hernia repair is therefore often undertaken in physiologically stressed patients and under less favorable operative conditions, leading to increased technical complexity and a greater risk of adverse outcomes. Previous studies have consistently reported higher rates of postoperative complications, bowel resection, surgical-site infection, prolonged hospitalization, intensive care admission, and mortality among patients undergoing emergency compared with elective hernia surgery [4,5]. Several factors influence the likelihood of emergency presentation, including delayed diagnosis, limited access to healthcare services, patient reluctance to seek treatment, advanced age, and the presence of significant comorbidities. While watchful waiting may be appropriate for selected asymptomatic patients, prolonged delay in repair can increase the risk of acute complications requiring urgent intervention [6]. Consequently, understanding the differences in outcomes between emergency and elective repair is essential for guiding clinical decision-making, optimizing surgical timing, prioritizing high-risk patients, and informing healthcare resource allocation. Although the association between emergency surgery and poorer outcomes is well recognized, institution-specific data remain valuable for evaluating local surgical practice, patient characteristics, and service performance. Therefore, the present comparative cohort study was conducted to evaluate and compare postoperative outcomes following emergency and elective abdominal wall hernia repair in adult patients, with particular emphasis on mortality, postoperative complications, surgical-site infection, bowel resection, length of hospital stay, and recurrence.

Aim: To compare outcomes of emergency and elective hernia repair in adults.

Primary objective: To compare 30-day mortality and major complications between emergency and elective repair.

Secondary objectives: (i) To compare SSI, bowel resection, length of stay, and recurrence; (ii) to estimate adjusted odds ratios for emergency-associated adverse outcomes.

Hypotheses: Null (H_0) — outcomes do not differ between emergency and elective repair. Alternative (H_1) — emergency repair is associated with worse outcomes.



2. Materials and Methods

This study was conducted and reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cohort studies.

2.1 Study Design and Setting

A comparative cohort study was conducted in the Department of General Surgery. The study aimed to compare postoperative outcomes between patients undergoing emergency abdominal wall hernia repair and those undergoing elective hernia repair.

2.2 Ethical Considerations

The study protocol was reviewed and approved. Written informed consent was obtained from all participants whenever applicable. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and its subsequent amendments.

2.3 Study Population

Adult patients (≥ 18 years) who underwent surgical repair for abdominal wall hernias, including inguinal, femoral, umbilical, incisional, and ventral hernias, were eligible for inclusion. Patients who underwent elective hernia repair during hospitalization for another unrelated surgical emergency and those with incomplete clinical or follow-up records were excluded from the study.

2.4 Study Groups and Outcome Measures

Participants were classified into two groups based on the indication and timing of surgery. The emergency group comprised patients who underwent urgent surgical intervention for incarcerated, obstructed, or strangulated hernias. The elective group included patients who underwent planned hernia repair under non-emergency conditions. The primary outcome was 30-day postoperative mortality. Secondary outcomes included major postoperative complications, defined as Clavien–Dindo grade III or higher, surgical-site infection (SSI), requirement for bowel resection, length of hospital stay, and hernia recurrence during follow-up.

2.5 Sample Size Estimation

Sample size calculation was based on detecting a clinically significant difference in the rate of major postoperative complications between emergency and elective hernia repair groups. Assuming complication rates of 22% and 7%, respectively, with a two-sided alpha level of 0.05 and statistical power of 80%, a minimum of approximately 90 participants per group was required. To account for variations in emergency case proportions and potential loss to follow-up, a total sample size of approximately 220 patients was targeted.



2.6 Statistical Analysis

Data were entered into Microsoft Excel and analysed using IBM SPSS Statistics version III. Continuous variables were assessed for normality and expressed as mean $\pm$ standard deviation (SD) or median with interquartile range (IQR), as appropriate. Categorical variables were summarized as frequencies and percentages. Comparisons between emergency and elective groups were performed using the independent-samples t-test or Mann–Whitney U test for continuous variables and the chi-square test or Fisher's exact test for categorical variables. Multivariable logistic regression analysis was conducted to determine the independent association between emergency surgery and adverse postoperative outcomes after adjustment for potential confounding variables including age, sex, American Society of Anesthesiologists (ASA) grade, and hernia type. Results were reported as adjusted odds ratios (aORs) with 95% confidence intervals (CIs). A two-tailed p-value of less than 0.05 was considered statistically significant.

3. Results

3.1 Cohort Characteristics

A total of 220 patients who underwent abdominal wall hernia repair were included in the study. Of these, 150 patients (68%) underwent elective repair, while 70 patients (32%) required emergency surgery due to incarceration, obstruction, or strangulation. Patients in the emergency group were significantly older than those undergoing elective repair, with a mean age of 63 ± 14 years compared with 52 ± 15 years in the elective group ($p < 0.001$). Emergency cases also had a greater burden of preoperative comorbidity, reflected by a significantly higher proportion of patients classified as ASA grade III–IV (44% vs. 22%, $p < 0.001$). Femoral hernias were more frequently encountered among emergency presentations than elective cases (26% vs. 8%, $p < 0.01$). Furthermore, bowel resection was required in 28 emergency cases compared with only 2 elective repairs, indicating a substantially higher incidence of bowel compromise among patients presenting emergently ($p < 0.001$) (Table 1).

Table 1. Characteristics by urgency of repair.

Variable	Elective	Emergency	p
Age (years), mean $\pm$ SD	52 $\pm$ 15	63 $\pm$ 14	<0.001
ASA III–IV, n (%)	33 (22)	31 (44)	<0.001
Femoral hernia, n (%)	12 (8)	18 (26)	<0.01
Bowel resection, n (%)	2	28	<0.001

3.2 Outcomes by urgency

Postoperative outcomes differed markedly between the two groups. The 30-day mortality rate was significantly higher among patients undergoing emergency repair than among those undergoing elective surgery (5.5% vs. 0.8%, $p < 0.001$). Similarly, major postoperative complications occurred more frequently in the emergency group, affecting 22% of patients compared with 7% in the elective group ($p < 0.001$). Surgical-site infections were also significantly more common following emergency



repair, occurring in 15% of patients compared with 5% of elective cases ($p < 0.001$). Prolonged hospital stay was observed in 38% of emergency patients, more than three times the rate seen in elective repairs (12%, $p < 0.001$). These findings demonstrate a consistently greater postoperative burden associated with emergency hernia surgery (Table 2, Figure 1).

Table 2. Outcomes by urgency of repair.

Outcome (%)	Elective	Emergency	p
30-day mortality	0.8	5.5	<0.001
Major complication	7	22	<0.001
Surgical-site infection	5	15	<0.001
Prolonged stay	12	38	<0.001

3.3 Adjusted associations

Multivariable logistic regression analysis was performed to determine whether emergency surgery independently influenced postoperative outcomes after adjustment for age, sex, ASA grade, and hernia type. Emergency hernia repair remained a strong independent predictor of adverse outcomes. Patients undergoing emergency surgery had nearly fivefold higher odds of 30-day mortality (adjusted odds ratio [aOR] ≈ 4.8) and more than threefold higher odds of major postoperative complications (aOR ≈ 3.2) compared with those undergoing elective repair. These associations persisted after controlling for potential confounding variables, confirming that emergency presentation itself is a major determinant of poor postoperative outcome (Figure 2).

Figure 1. Postoperative outcomes after emergency versus elective hernia repair

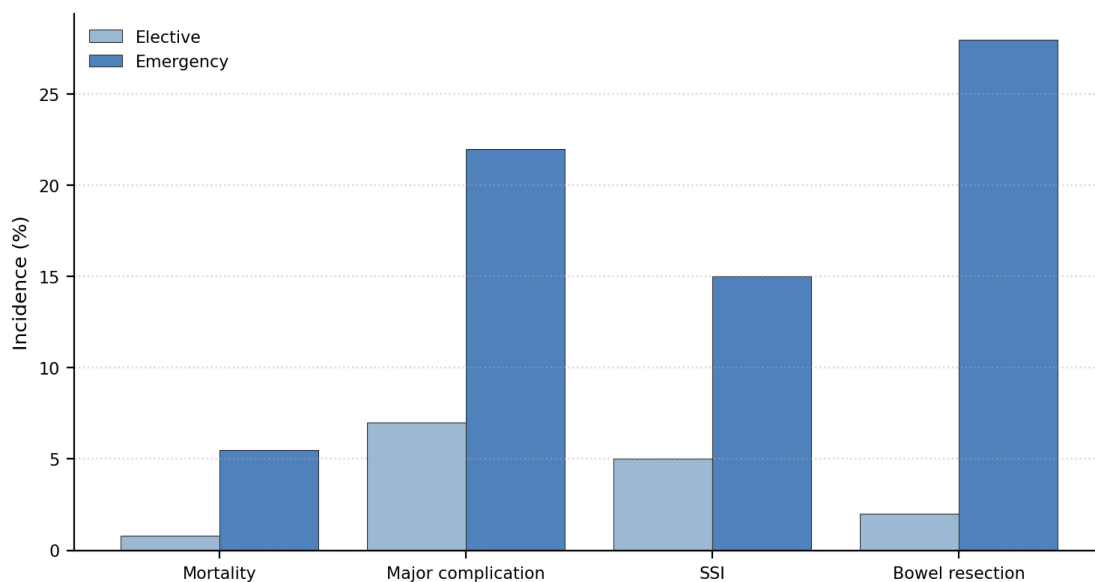
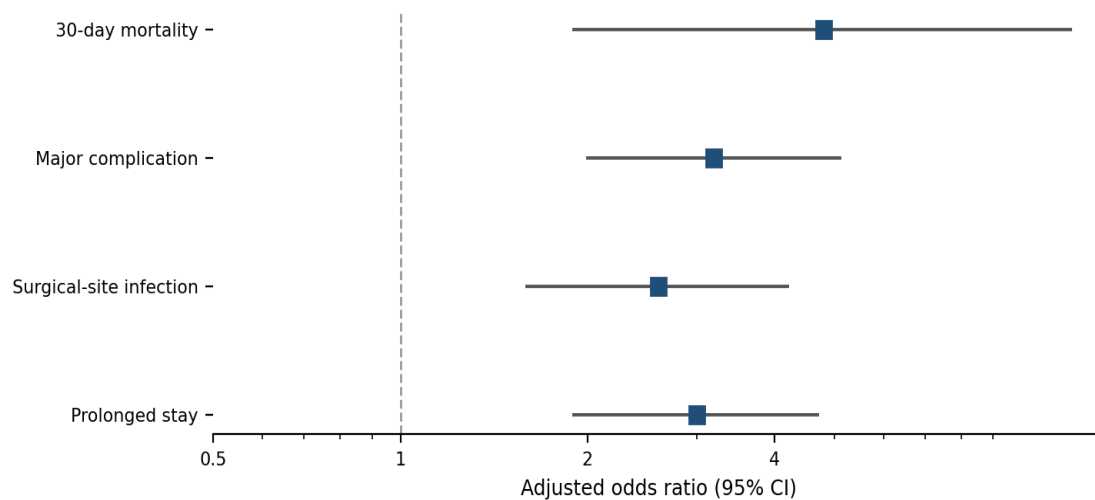


Figure 1. Postoperative outcomes after emergency versus elective hernia repair.

**Figure 2. Adjusted odds ratios for adverse outcomes with emergency (vs elective) repair****Figure 2.** Adjusted odds ratios (95% CI) for adverse outcomes with emergency repair.

4. Discussion

In this comparative cohort study, emergency abdominal wall hernia repair was associated with substantially poorer postoperative outcomes than elective repair. Patients undergoing emergency surgery experienced significantly higher rates of 30-day mortality, major postoperative complications, surgical-site infection, bowel resection, and prolonged hospital stay. Importantly, emergency presentation remained an independent predictor of adverse outcomes even after adjustment for age, sex, ASA grade, and hernia type, indicating that the urgency of presentation itself contributes significantly to postoperative risk. The observed differences are biologically plausible and consistent with previous literature. Emergency hernia repair is frequently necessitated by incarceration, intestinal obstruction, or strangulation, conditions that may compromise bowel perfusion and lead to ischemia, necrosis, and systemic inflammatory responses. Consequently, these patients often require more complex surgical procedures, including bowel resection, which increases operative duration, contamination risk, and postoperative morbidity [7,8]. In the present study, bowel resection was required far more frequently in emergency cases, highlighting the severe pathological consequences of delayed presentation. Such circumstances likely contribute to the higher rates of postoperative infection, major complications, and mortality observed in the emergency group. Another important finding was the older age and greater comorbidity burden among patients requiring emergency repair. A significantly larger proportion of emergency patients were classified as ASA grade III–IV, suggesting reduced physiological reserve and an increased susceptibility to postoperative complications. Additionally, femoral hernias were disproportionately represented among emergency presentations. This observation aligns with established evidence that femoral hernias have a greater tendency toward incarceration and strangulation because of their narrow anatomical neck, making them particularly prone to emergency presentation and bowel compromise [9]. The findings of this study have important clinical implications. Timely elective repair of symptomatic hernias may prevent progression to incarceration or strangulation, thereby reducing the need for emergency surgery and its associated morbidity and mortality. While watchful waiting remains appropriate for selected



asymptomatic patients, careful risk assessment and patient counselling are essential, particularly in elderly individuals, patients with significant comorbidities, and those with femoral hernias, who may face greater risks if emergency intervention becomes necessary [10]. Furthermore, healthcare systems should prioritize efficient elective surgical pathways and reduce waiting times to minimize preventable emergency presentations. The strengths of this study include the direct comparison of emergency and elective cohorts, the use of standardized outcome measures, and adjustment for important confounding variables through multivariable analysis. However, several limitations should be acknowledged. As an observational study, residual confounding cannot be completely excluded, and differences between groups may partly reflect factors not captured in the analysis. The single-centre design may limit external validity, and recurrence assessment was constrained by variable follow-up duration. Future multicentre prospective studies and analyses of long-term watchful-waiting cohorts are warranted to better define the balance between elective intervention and conservative management and to identify strategies that reduce emergency hernia presentations and improve patient outcomes.

5. Conclusion

Emergency abdominal wall hernia repair was associated with significantly greater postoperative mortality, major complications, surgical-site infections, bowel resection rates, and prolonged hospital stay compared with elective repair. Even after adjustment for age, comorbidity burden, and hernia type, emergency presentation remained an independent predictor of adverse postoperative outcomes, underscoring the substantial risks associated with delayed or complicated hernia presentation. These findings highlight the clinical importance of timely elective surgical intervention for symptomatic hernias to prevent progression to incarceration, obstruction, or strangulation and to reduce the likelihood of severe postoperative complications. Early identification and appropriate surgical management of patients at increased risk of emergency presentation may improve outcomes and decrease healthcare utilization. The results further support efforts to optimize access to elective hernia services and enhance patient counselling regarding the potential risks of postponing surgery. Nevertheless, larger multicentre prospective studies are required to validate these findings across diverse populations and healthcare settings and to further define strategies that minimize emergency hernia presentations and improve long-term surgical outcomes.

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