Section: General Surgery

Original Research Article

PREOPERATIVE RISK STRATIFICATION AND OUTCOMES IN HERNIA SURGERY

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ABSTRACT

Background: Hernia repair is among the most commonly performed surgical procedures worldwide, particularly in the elderly population. Advanced age, multiple comorbidities, frailty, and emergency presentation significantly increase perioperative morbidity and mortality. Preoperative risk stratification is essential to identify high-risk patients, optimize comorbid conditions, and improve surgical outcomes. The aim is to evaluate the role of preoperative risk stratification in predicting postoperative outcomes in patients aged 60 years and above undergoing hernia repair. **Materials and Methods:** This prospective observational study was conducted at a tertiary care teaching hospital over a period of 31 months. A total of 320 patients aged ≥60 years undergoing inguinal or ventral hernia repair were included. Patients were stratified into low-risk (ASA I–II), moderate-risk (ASA III), and high-risk (ASA IV) groups based on the American Society of Anesthesiologists (ASA) classification. Demographic data, comorbidities, type of hernia, type of surgery, anesthesia, postoperative complications, ICU admission, length of hospital stay, and 30-day mortality were analyzed using SPSS version 26. **Result:** The majority of patients were aged 60–70 years (56.3%), with a marked male predominance (90.6%). Inguinal hernia was the most common type (65.6%). Hypertension (56.3%) and diabetes mellitus (40.6%) were the most frequent comorbidities. Elective surgeries accounted for 71.9% of cases. Postoperative complications increased significantly with higher ASA grades, occurring in 6.7% of low-risk, 20.8% of moderate-risk, and 40% of high-risk patients. ICU admissions were more common in ASA III and IV patients. Thirty-day mortality was significantly higher in emergency surgeries compared to elective procedures (6.67% vs. 0.87%). **Conclusion:** Preoperative risk stratification using ASA classification and comorbidity assessment is an effective predictor of adverse surgical outcomes in elderly patients undergoing hernia repair. Early elective surgery with optimization of comorbidities significantly reduces postoperative complications, ICU requirements, and mortality.

INTRODUCTION

Hernia repair is one of the most commonly performed surgical procedures worldwide and constitutes a significant proportion of the workload in general surgery. With increasing life expectancy, the number of elderly patients presenting with inguinal and ventral hernias has risen substantially. Aging is associated with progressive physiological decline, reduced organ reserve, and a higher prevalence of chronic systemic diseases, all of which contribute to increased perioperative risk and poorer postoperative outcomes. Consequently, optimizing surgical care for elderly patients undergoing hernia repair has become an important clinical challenge.[1,2]

Inguinal hernia is the most frequent type of hernia, particularly among men over the age of 50 years. Factors such as heavy physical activity, chronic cough, constipation, and connective tissue weakness have been implicated in its development. Although hernia repair is generally considered a low-risk procedure, outcomes can vary significantly in elderly patients due to the presence of comorbidities such as hypertension, diabetes mellitus, chronic obstructive pulmonary disease, and ischemic heart disease. These comorbid conditions increase susceptibility to postoperative complications, prolonged hospitalization, and mortality.[3,4]

Emergency hernia repair is associated with substantially higher morbidity and mortality when compared to elective surgery. Delayed presentation

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may result in complications such as incarceration, strangulation, or bowel obstruction, necessitating urgent surgical intervention. Several studies have demonstrated that advanced age, emergency surgery, bowel resection, and higher American Society of Anesthesiologists (ASA) grades are strong predictors of adverse outcomes. Therefore, early diagnosis and timely elective repair are essential to minimize surgical risk.

Preoperative risk stratification plays a pivotal role in identifying patients at increased risk of postoperative complications. The ASA classification system remains one of the most widely used and practical tools for assessing perioperative risk. In addition to ASA grading, comprehensive evaluation of comorbidities, functional status, and physiological reserve is crucial, particularly in elderly patients. Recent evidence suggests that risk stratification based solely on chronological age is inadequate, and greater emphasis should be placed on biological age, frailty, and overall health status.

Despite the availability of various risk prediction models, standardized preoperative risk assessment is not consistently applied in routine surgical practice, especially in resource-limited settings. There is a need for simple, reliable, and clinically applicable tools that can guide surgical decision-making and perioperative planning. Understanding the relationship between preoperative risk stratification and surgical outcomes can help clinicians optimize patient selection, improve perioperative care, and reduce complications. This study was undertaken to evaluate the impact of preoperative risk stratification using ASA classification and comorbidity assessment on postoperative outcomes in elderly patients undergoing inguinal and ventral hernia repair at a tertiary care centre.

MATERIALS AND METHODS

Study Design and Setting: This prospective observational study was conducted at a tertiary care teaching hospital with a high volume of general surgical procedures. The study aimed to evaluate the impact of preoperative risk stratification on postoperative outcomes in patients undergoing hernia repair. All patients received standard clinical care, and no additional interventions were introduced for study purposes.

Study Duration: The study was carried out over a period of 31 months, from January 2023 to July 2025. Each patient was followed for 30 days postoperatively to assess short-term surgical outcomes and complications.

Study Population: Patients aged 60 years and above undergoing inguinal or ventral hernia repair, either electively or as an emergency, were screened for eligibility and enrolled consecutively.

Inclusion Criteria

- Patients aged ≥60 years
- Patients undergoing inguinal or ventral hernia repair
- Patients deemed fit for surgery
- Patients providing written informed consent

Exclusion Criteria

- Patients aged <60 years
- Recurrent hernia cases
- Hernias associated with malignancy
- Patients requiring bowel resection
- Palliative surgical cases
- Incomplete data or loss to follow-up

Sampling Method and Sample Size: Purposive consecutive sampling was employed. All eligible patients presenting during the study period were included. The sample size was calculated based on an anticipated postoperative complication rate of 25%, with a 5% margin of error and a 95% confidence interval. A 10% allowance for dropouts was included, resulting in a final sample size of 320 patients.

Preoperative Risk Stratification: All patients underwent preoperative evaluation, including clinical examination and assessment of comorbid conditions. Risk stratification was performed using the American Society of Anesthesiologists (ASA) physical status classification system. Patients were categorized into three risk groups:

- Low risk: ASA I–II
- Moderate risk: ASA III
- High risk: ASA IV

Data Collection: Data were collected using a structured proforma from patient interviews, medical records, operative notes, and postoperative follow-up visits. The following variables were recorded:

- Demographic data (age, sex)
- ASA grade and associated comorbidities (hypertension, diabetes mellitus, chronic obstructive pulmonary disease, ischemic heart disease)
- Type of hernia (inguinal, ventral, bilateral/mixed)
- Type of surgery (elective or emergency)
- Type of anesthesia (spinal, general, or local)
- Duration of surgery
- Postoperative complications
- Requirement for intensive care unit (ICU) admission
- Length of hospital stay
- Readmission within 30 days
- Thirty-day postoperative mortality

All collected data were anonymized and verified for completeness and accuracy by the research team.

Outcome Measures: The primary outcome measures were postoperative complications and 30-day mortality. Secondary outcome measures included ICU admission, length of hospital stay, and readmission rates.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistics were expressed as frequencies, percentages, means, and standard deviations. Inferential statistics were performed using the chi-square test for categorical variables and independent

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t-test for continuous variables. Logistic regression analysis was used to assess predictors of adverse outcomes. A p-value <0.05 was considered statistically significant.

Ethical Considerations: Ethical approval for the study was obtained from the Institutional Ethics Committee prior to initiation. Written informed consent was obtained from all participants. Confidentiality of patient data was strictly maintained, and the study adhered to the ethical principles outlined in the Declaration of Helsinki.

RESULTS

A total of 320 patients aged 60 years and above undergoing inguinal or ventral hernia repair were included in the study. Patients were followed for 30 days postoperatively to assess outcomes.

Table 1: Age and Gender Distribution of Study Participants

Variable	Number (n=320)	Percentage (%)
Age Group (years)		
60–69	180	56.3
70–79	90	28.1
≥80	50	15.6
Gender		
Male	290	90.6
Female	30	9.4

The majority of patients were in the 60–69 years age group (56.3%). Male patients constituted 90.6% of the study population, reflecting the higher prevalence of hernias among males.

Table 2: Distribution of Hernia Type

Type of Hernia	Number	Percentage (%)
Inguinal	210	65.6
Ventral	90	28.1
Bilateral / Mixed	20	6.3
Total	320	100

Inguinal hernia was the most common type (65.6%), followed by ventral hernia (28.1%).

Table 3: ASA Classification of Patients

ASA Grade	Number	Percentage (%)
I	20	6.3
II	130	40.6
III	120	37.5
IV	50	15.6
Total	320	100

Most patients belonged to ASA class II (40.6%) and ASA class III (37.5%), while 15.6% were classified as high-risk ASA IV.

Table 4: Distribution of Comorbidities

Comorbidity	Number	Percentage (%)
Hypertension	180	56.3
Diabetes Mellitus	130	40.6
COPD	60	18.8
Ischemic Heart Disease	40	12.5

Hypertension (56.3%) and diabetes mellitus (40.6%) were the most prevalent comorbid conditions. Chronic obstructive pulmonary disease and ischemic heart disease were present in 18.8% and 12.5% of patients, respectively.

Table 5: Postoperative Complications by ASA Risk Group

Risk Group (ASA)	Total Patients	Patients with Complications	Complication Rate (%)
Low (I–II)	150	10	6.7
Moderate (III)	120	25	20.8
High (IV)	50	20	40.0
Total	320	55	17.2

Postoperative complications showed a strong association with higher ASA grades. Complication rates increased progressively from low-risk to high-risk groups.

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Table 6. ICU Admission and 30-Day Mortality

Outcome	Category	Number	Percentage (%)
ICU Admission	ASA I–II	5	3.3
	ASA III	15	12.5
	ASA IV	25	50.0
30-Day Mortality	Elective Surgery	2	0.87
	Emergency Surgery	6	6.67

ICU admission was significantly higher among patients with ASA III and IV. Thirty-day mortality was markedly higher in emergency surgeries compared to elective procedures. Elective surgeries accounted for 71.9% of cases, while 28.1% were performed as emergency procedures. Spinal anesthesia was the most commonly used anesthetic technique (65.6%).

DISCUSSION

Hernia repair in elderly patients presents unique challenges due to age-related physiological decline, increased prevalence of comorbidities, and higher likelihood of emergency presentation. The present study demonstrates that preoperative risk stratification using ASA classification and comorbidity assessment is a strong predictor of postoperative complications, ICU admission, and short-term mortality in patients aged 60 years and above undergoing hernia repair.

In this study, the majority of patients were between 60 and 69 years of age, with a marked male predominance, findings that are consistent with recent epidemiological studies. Agarwal,[1] reported a similar demographic pattern, attributing the male predominance to anatomical factors and occupational stressors that predispose men to inguinal hernias. Our findings reaffirm that while age is an important consideration, it is not an independent predictor of poor outcomes.

Inguinal hernia was the most common presentation in our cohort, aligning with contemporary registry-based data. Mehdizadeh-Shrifi et al,[6] analyzing outcomes from the Herniamed Registry, reported that inguinal hernias remain the predominant type even in patients over 80 years of age, though postoperative complications were significantly influenced by systemic illness rather than hernia type itself. This observation parallels our results, where complications correlated more strongly with ASA grade than with hernia anatomy.

Comorbidities played a critical role in determining surgical outcomes. Hypertension and diabetes mellitus were the most prevalent conditions in our study population. Recent studies by Delaney et al,[7] and Ushnevych,[8] have emphasized that poorly controlled cardiometabolic comorbidities significantly increase postoperative morbidity in hernia surgery. These authors advocate for structured preoperative optimization programs, which may explain the lower complication rates observed in elective cases in our study.

ASA classification emerged as a robust predictor of postoperative complications, with complication rates rising progressively from low-risk to high-risk groups. Similar findings were reported by Kushner et al,[9] who evaluated outcomes under the Geriatric Assessment and Medical Preoperative Screening (GrAMPS) program and demonstrated that ASA grade and multimorbidity were more predictive of adverse outcomes than chronological age alone. Our study supports this evidence by demonstrating a 40% complication rate among ASA IV patients.

Emergency surgery was associated with significantly higher mortality in our cohort. This finding is consistent with recent large-scale analyses. Basta et al,[10] and Mehdizadeh-Shrifi et al,[6] reported that emergency hernia repairs are independently associated with increased mortality, particularly in elderly patients with compromised physiological reserve. Delayed presentation leading to incarceration or strangulation remains a major contributor to poor outcomes, highlighting the importance of early elective intervention.[11]

ICU admission rates increased significantly with higher ASA grades in the present study. This observation mirrors findings by Ushnevych,[8] who emphasized that high-risk hernia patients benefit from planned postoperative critical care monitoring. Anticipating ICU requirements through preoperative risk stratification allows for better resource allocation and improved perioperative safety.

Overall, our findings reinforce recent evidence that structured preoperative risk assessment using simple, clinically applicable tools such as ASA classification can significantly influence outcomes in elderly hernia patients. Incorporating comorbidity optimization, timely elective surgery, and individualized perioperative planning can substantially reduce postoperative complications, ICU utilization, and mortality.

CONCLUSION

Preoperative risk stratification plays a crucial role in determining surgical outcomes in elderly patients undergoing hernia repair. This study demonstrates that postoperative morbidity and mortality are influenced more by ASA classification, associated comorbidities, and emergency presentation than by chronological age alone. Patients with higher ASA grades experienced significantly increased postoperative complications, greater ICU requirements, and higher short-term mortality.

Elective hernia repair following adequate optimization of comorbid conditions was associated

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with markedly better outcomes compared to emergency surgery. Early identification of high-risk patients through structured preoperative assessment allows for individualized perioperative planning, appropriate anesthetic selection, and anticipation of postoperative care needs.

Routine implementation of standardized risk stratification tools, along with proactive optimization of modifiable risk factors, can improve surgical safety, reduce complications, minimize ICU utilization, and lower mortality rates in elderly hernia patients. These findings support the adoption of systematic preoperative evaluation protocols to enhance outcomes in hernia surgery, particularly in aging populations.

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