Mortality After Inpatient Open Ventral Hernia Repair: Developing A Risk-Stratification Tool Based Upon 55,760 Operations.

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Background

350,000 ventral hernia repairs (VHR) are performed yearly in the US, with open repairs comprising the majority of cases (1). The medical complexity of the hernia patient imparts higher risk for serious complications, poor quality of life, and higher costs. Mortality is a distinct reality, and while prior studies have identified risk factors for mortality, they have been limited to small series lacking generalizability (2). Furthermore, no study has stratified patients based upon risk. The purpose of this study is to utilize a widely-generalizable dataset (ACS-NSQIP) to develop a risk-stratification model for mortality based solely upon preoperative factors, with the hopes of improving decision-making, patient guidance, and minimizing perioperative mortality.

Methods

Patients undergoing inpatient open VHR were identified from the 2005-2012 ACS-NSQIP databases (3). Patient comorbidities and preoperative variables were analyzed to determine statistical correlation with mortality risk. A step-wise multivariate logistic regression of all factors with p value< 0.1 was conducted and resulting significant factors were entered into a bootstrap technique. Adjusted multivariate beta-coefficients were utilized to generate weighted risk scores for each factor. Subsequently, each patient was assigned an aggregate mortality risk score, yielding the risk-assessment tool for preoperative decision-making.

Results

55,760 patients underwent inpatient open VHR with an overall mortality rate of 1.26% (n=704). Independent patient factors predictive of mortality included: partial/total dependent functional status (OR=2.32), cardiovascular (OR=1.23), pulmonary (OR=1.99), renal (OR=1.81), or liver disease (OR=3.19), anemia (OR=1.32), malnutrition (OR=1.83), age>65 years (OR=2.29), ASA 4 or higher (OR=3.83), metastatic cancer (OR=2.14), and systemic inflammation (OR=1.82)(Table 1). Operative factors included emergent case (OR=1.55), wound contamination (OR=1.71), and concurrent intra-abdominal procedure (OR=1.36). Patients were stratified into 4 groups according to mortality risk: low-risk (mortality=0.37%), moderate-risk (mortality=2.24%), high-risk (mortality=10.93%), and extreme-risk (mortality=32.65%)(Figure 1). Additionally, length of stay, unplanned reoperations, and medical complications all increased across the 4 patient groups. The bootstrap model demonstrated high sensitivity and specificity for discriminating mortality risk with a C-statistic=0.87.

Conclusions

This study is the first to provide an accurate model to predict mortality risk based upon preoperative risk factors in patients undergoing open VHR. The strongest predictors were ASA 4 or higher, liver disease, functional status, and older age. This tool allows surgeons to better counsel patients preoperatively and improve clinical decision-making to reduce complication rates and optimize outcomes, patient satisfaction, and cost-efficacy.

References

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