The Role of Preoperative Laboratory Values in Predicting 30-Day Mortality after Total Hip Arthroplasty

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INTRODUCTION: Total hip arthroplasty (THA) is one of the most common orthopaedic procedures used to improve pain and quality of life in patients with severe arthritis. It is largely regarded as an incredibly reliable and safe procedure with pooled mortality rates of 0.3% and 0.6% at 30 and 90 days respectively; however, it is crucial for surgeons to identify which patients are at highest risk during preoperative risk stratification. Older age, male gender, ASA > 2, and medical comorbidities such as cardiovascular disease, cirrhosis, and renal disease are factors that are strongly associated with greater risk of mortality following THA. 2-5 In contrast, there are a paucity of studies examining the association of various preoperative laboratory values with mortality rates after THA. International normalized ratio (INR) and preoperative anemia are two such tests that have been shown to be significant predictors of mortality. Further understanding the influence of preoperative lab values on mortality may help surgeons better stratify and mitigate risk of mortality in their patients before operating.

METHODS: A total of 340,692 patients undergoing total hip arthroplasty were identified using the National Surgical Quality Improvement Program (NSQIP) database. Preoperative lab results collected prior to surgery were analyzed and were controlled for after 1:4 propensity score matching. Multiple logistic regressions were performed while controlling for age, sex, ASA status, diabetes, smoker, and coagulation factors which provided the studies primary results. Mortality 30 days after index THA served as the primary outcome of interest. Furthermore, the optimal cutoff was determined by performing ROC curves along with utilizing the F1 scoring method to identify the effectiveness at various preoperative lab result cut off values to predict death.

RESULTS: In total, 384 patients experienced mortality within the specified timeframe. Statistical analysis revealed significant findings for all laboratory parameters examined. Hematocrit levels demonstrated a strong inverse association with mortality ($p < 0.001$, OR = 0.89, 95% CI: 0.866-0.907) with the optimal cut off being 28.7%. Similarly, lower levels of preoperative albumin were also significantly associated with increased mortality ($p < 0.001$, OR = 0.24, 95% CI: 0.191-0.301) and higher preoperative sodium levels showed an inverse effect for mortality ($p < 0.001$, OR = 0.90, 95% CI: 0.876-0.933) with optimal cutoff values being 2.9 g/dL and 129 mEq/L respectively. However, elevated white blood cell counts, and preoperative creatinine levels were associated with increased mortality risk ($p < 0.001$, OR = 1.13, 95% CI: 1.088-1.175 and $p < 0.001$, OR = 1.30, 95% CI: 1.169-1.447, respectively) with optimal predictive power being achieved at preoperative value of 14.9 (10^9/L) and 3.19 (mg/dL) respectively.

DISCUSSION AND CONCLUSION: The investigation revealed compelling evidence that preoperative levels of hematocrit, albumin, and sodium function as effective defensive factors against 30-day mortality post Total Hip Arthroplasty (THA), denoting specific cutoff values of 27.7%, 2.9 g/dL, and 129 mEq/L, respectively. However, white blood cell counts and creatinine levels were positively correlated with mortality, observed at preoperative values of 14.9 (10^9/L) and 3.19, respectively. These results offer essential insights, enabling healthcare professionals to make more informed decisions regarding patient preoperative optimization. Nonetheless, additional exploration is necessary to ascertain the exact impact of these relationships on mortality rates. Moreover, to formulate universally applicable statements concerning lab values associated with post-THA mortality, a more extensive database and a robust set of predictive indicators are needed.