

# Comparative Performance of Albumin-based Biomarker Indices for predicting Postoperative Outcomes in Metastatic Spine Tumor Surgery: A National Database Analysis

Ali Haider Bangash (Bronx, États-Unis), Temitope Adegbenro (Bronx, États-Unis), Sertac Kırmaz (Bronx, États-Unis), Ross Fluss (Bronx, États-Unis), Victoria Cao (Bronx, États-Unis), Alexander Alexandrov (Bronx, États-Unis), Liza Belman (Bronx, États-Unis), Esli Nájera Samaniego (Tlalpan, Mexico City, Mexique), Saikiran Murthy (Bronx, États-Unis), Yaroslav Gelfand (Bronx, États-Unis), Reza Yassari (Bronx, États-Unis), Rafael De La Garza Ramos (Bronx, États-Unis)

## Introduction

Preoperative risk stratification remains challenging in metastatic spine tumor surgery. While hypoalbuminemia predicts poor outcomes, composite biomarker indices incorporating liver function and hemoglobin may offer superior prognostic value. The albumin-bilirubin index (ALBI) and albumin-hemoglobin index (AHI) represent novel composite markers adopted in other oncological patient populations. However, their comparative performance against traditional serum albumin levels for predicting outcomes in spine oncology remains unexplored, limiting evidence-based risk assessment strategies.

## Materials and Methods

We conducted a retrospective analysis of the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database (2018-2023). Patients with disseminated cancer undergoing metastatic spine surgery with complete preoperative albumin, bilirubin, and hematocrit data were included. ALBI score was calculated as albumin-to-bilirubin ratio, while AHI score utilized albumin-to-hemoglobin ratio (hemoglobin derived from hematocrit). The primary endpoint was 30-day mortality and secondary endpoint was major complications. Univariable logistic regression and receiver operating characteristic (ROC) analysis compared discriminative performance. DeLong's test evaluated pairwise area under the ROC curve (AUROC) differences.

## Results

Among 2,097 patients (mean age 63 years, 60% male), 30-day mortality was 8% (n=170) and major complications occurred in 20% (n=421). All three biomarkers significantly predicted mortality on the univariable analysis. However, none of the predictors achieved good discrimination ( $AUC < 0.75$ ) for either mortality (albumin AUROC 0.68, ALBI 0.64, AHI 0.56) or major complications (AUROCs 0.61, 0.54, 0.53 respectively). Pairwise comparisons demonstrated albumin consistently outperformed AHI for both endpoints, while results between albumin and ALBI varied by outcome.

## Conclusion

Traditional serum albumin maintains superior discriminative performance compared to composite indices for predicting outcomes in metastatic spine tumor surgery. While all biomarkers demonstrate statistical significance, none achieve clinically adequate discrimination, highlighting the need for multivariable prediction models incorporating additional risk factors.