# Comparison of the Predictive Value of Serum Prealbumin vs Albumin on Lumbar Fusion Outcomes

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INTRODUCTION: Postoperative complications following spinal surgery can result in significant patient harm and increased costs due to longer hospital stays, additional diagnostic tests, and further treatment. The incidence of complications after spinal surgery has been reported to range from 5 to 20%. Given the seriousness and frequency of complications, it is crucial to identify preoperative risk factors that may place patients at a higher risk. Nutritional biomarkers, such as albumin, have been theorized to predict postoperative complications. However, the long half-life of albumin has raised concerns about its use as a proximate nutritional marker. Prealbumin, with its shorter half-life, has been hypothesized to be more accurate. The purpose of this study was to assess the predictive value of prealbumin, in comparison to levels of albumin, on the primary outcome variables of postoperative complication rates, hospital length of stay, and rates of 90-day readmission following lumbar spinal fusion surgery.

METHODS: This retrospective analysis of prospectively collected laboratory values included all patients who underwent lumbar spinal fusion at a Level I academic trauma center from 2015-2022. The study was approved by the Institutional Review Board at our institution. Postoperative complications included infections, major cardiac events, ileus, pneumonia, deep vein thrombosis, pulmonary embolism, kidney failure, hardware failure, ICU admission, sepsis, delirium, and reintubation occurring within 30 days of surgery. Independent variables included age, sex, body mass index (BMI), number of surgery levels, American Society of Anesthesiologists score (ASA), serum albumin and prealbumin levels. Univariate and logistic regression analyses were conducted to assess the impact of these variables on the occurrence of complications, readmissions, and hospital stay duration. Patients with missing data or insufficient follow up were not included.

RESULTS: A total of 683 patients were included in the analysis. Patients consisted of 62% women with a mean age of 62.7 ($\pm$11.6) years with 3.7 ($\pm$2.9) levels fused with a range of 2-18. Postoperatively, 74 (11%) patients experienced a major complication and 36 (5%) were readmitted within the 90-day follow up period. The average length of stay was 4.1 ($\pm$2.3) days. Univariate analysis revealed that of the patients with major postoperative complications, 23 (31%) had low albumin ($p<0.0001$), while 5 (7%) had low prealbumin ($p=0.0070$) and 5 (7%) had concurrent low albumin and prealbumin ($p=0.0012$). Hypoalbuminemia was also detected in 11 (31%) patients who were readmitted ($p=0.0021$). Multivariate logistic regression indicated that hypoalbuminemia (OR 2.1, CI 1.09-4.1; $p=0.0278$) was predictive of major postoperative complications, though hypoprealbuminemia was not. Neither albumin nor prealbumin levels predicted readmissions on multivariate analysis. Multiple linear regression of hospital stay duration revealed that hypoalbuminemia (CI 0.59-1.55; $p<0.0001$) and hypoprealbuminemia (CI 0.87-2.9; $p=0.0003$) were significant predictors of increased length of stay.

DISCUSSION: Preoperative serum albumin levels were a better predictor of major postoperative complications than prealbumin levels, while neither predicted readmissions, and both predicted increased hospital stay. This data suggests that the longer half-life of albumin may make it an indicator of a prolonged malnourished state and negative health status, ultimately making it a superior predictor of complications than the more immediate nutritional status indicated by prealbumin. Limitations to our study include that it was conducted at an urban Level I academic center in a city with a majority white population. Our cohort reflects this, leading to decreased external validity. Additionally, our study only included patients who returned to our institution for their follow-up care or whose providers shared their information with us. Because of this, it's possible there were additional patients with outcomes of interest that were not captured in our study. This study builds upon previous research that found a correlation between hypoalbuminemia and the risk of complications following spine surgery. It also contradicts some studies that found prealbumin to be predictive of postoperative complications. Our efforts differ from those of previous studies in that we aimed to compare the differences in the predictive value of hypoalbuminemia and hypoprealbuminemia, rather than analyzing one of them. The current cohort of 683 patients is also substantially larger than the sample sizes used in previous studies.

SIGNIFICANCE/CLINICAL RELEVANCE: Overall, this study provided new information on the use of biomarkers of nutritional status in the prediction of postoperative complications, readmissions, and length of hospital stay. Preoperative serum albumin levels may aid in risk-stratification of patients as superior predictors of postoperative complications following lumbar fusion compared to prealbumin, though both may predict length of hospital stay.