

## Complete Blood Count-Based Biomarker Ratios Predict the Risk of Adverse Events after Total Knee Arthroplasty

Julian Wier MD<sup>1</sup>, Ian A Jones MD<sup>2</sup>, Matthew S. Chen BA<sup>1</sup>, Kevin C. Liu BS<sup>1</sup>, Ryan Palmer BS<sup>1</sup>, Cory K. Mayfield MD<sup>1</sup>, Nathanael D. Heckmann MD<sup>1</sup>

<sup>1</sup>Department of Orthopaedic Surgery, Keck School of Medicine of the University of Southern California, <sup>2</sup>Department of Anaesthesiology, University of Washington, Seattle, Washington  
rcpalmer@usc.edu

**Disclosures:** Julian Wier (N), Ian A Jones (N), Matthew S. Chen (N), Kevin C. Liu (N), Ryan Palmer (N), Cory K. Mayfield (N), Nathanael D. Heckmann (1: Corin U.S.A.; 3B: Intellijoint Surgical, MicroPort Orthopedics, Corin U.S.A, Zimmer; 4: Intellijoint Surgical; 9: AAOS, AJRR, AAHKS)

**INTRODUCTION:** Complete blood count (CBC) based ratios (CBRs), including Neutrophil-Lymphocyte Ratio (NLR), Monocyte-Lymphocyte Ratio (MLR), Platelet-Lymphocyte Ratio (PLR), and Systemic Immune-Inflammation Index (SII) have been used to predict outcomes in non-orthopedic surgery. This study sought to evaluate the utility of CBRs in predicting postoperative complications, protracted hospital length of stay, and mortality after elective total knee arthroplasty (TKA).

**METHODS:** The Premier Healthcare Database was retrospectively queried for adult patients who underwent primary, elective TKA. Approximate cut-point values for CBRs were identified via bootstrap simulation using Youden's index. Multivariable adjusted restricted cubic spline models using the predicted cutpoint value as the threshold for odds of outcomes were created to identify a final threshold value (TV) associated with increased adjusted odds ratio (aOR) of study outcomes.

**RESULTS:** 20,061 TKAs were identified. All measures predicted odds of aggregate postoperative complications (NLR TV: 3.7 [aOR: 1.69], MLR TV: 0.41 [aOR: 1.62], PLR TV: 205.1 [aOR: 1.43], SII TV: 1,013.1 [aOR: 1.62]; all  $p < 0.001$ ). A length of stay  $\geq 3$  days was associated with TVs of NLR  $> 13.1$  [aOR: 1.38] and MLR  $> 0.41$  [aOR: 1.29] (all  $p < 0.001$ ). No association between inflammatory markers and inpatient mortality was observed.

**DISCUSSION:** The results of the study demonstrate the prognostic value of NLR, MLR, PLR, and SII as markers for total postoperative complications and increased length of stay following TKA. All four CBRs predicted overall complications, with SII demonstrating the highest specificity. However, only NLR and MLR were predictive of prolonged length of stay, with MLR being more predictive overall. Patients presenting with NLR  $> 2.8$ , PLR  $> 205.1$ , MLR  $> 0.33$ , and SII  $> 863.2$  should be considered high-risk for these adverse outcomes. To the best of our knowledge, this is the first study to assess the association between composite postoperative outcomes following TKA and CBRs. That being said, the study also does have several limitations, including its retrospective nature, the potential for sampling bias, and the risk of mortality and long-term morbidity being censored given the limited observation period and inability to capture deaths following the initial hospital stay.

**SIGNIFICANCE/CLINICAL RELEVANCE:** NLR, MLR, PLR, and SII are associated with adverse postoperative outcomes after TKA. Using CBRs, clinicians may enhance their ability to identify high-risk patients using routine preoperative laboratories.