Determining the Threshold for WBC Count & Differential in Predicting Failure After Reimplantation: A Multicenter Study

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INTRODUCTION:
Two-stage exchange arthroplasty remains a popular treatment option for chronic periprosthetic joint infection (PJI). Although down trending serological and synovial markers are used to help guide timing of reimplantation, there remains a paucity of data in the literature on the ideal thresholds of these markers for determining infection control. The purpose of this multicenter study was to establish a cutoff for synovial cell count and differential in predicting failure following reimplantation.
METHODS:
This retrospective study identified patients undergoing reimplantation with preoperative synovial fluid analysis between 2007 and 2021 at five institutions. Patients with an extended time to reimplantation (>1 year) were excluded. Treatment success was defined using the Musculoskeletal Infection Society Outcome-Reporting Tool. Receiver operating characteristic curves were used to assess the prognostic utility of white blood cell count (WBC), polymorphonuclear leukocyte percentage (PMN%), as well as the combination of the two markers in predicting failure following reimplantation at minimum 1-year follow-up.
RESULTS:
385 patients with a mean follow-up time of 4.6 ± 2.5 years were included. Of these, 93 (24.2%) patients were found to have experienced treatment failure. WBC/PMN% combination (AUC 0.651, sensitivity 44.2%, specificity 85.9%) demonstrated the highest prognostic utility followed by PMN% (AUC 0.644, sensitivity 47.8%, specificity 76.8%) and WBC count (AUC 0.571, sensitivity 36.6%, specificity 87.3%). Using the Youden index, WBC >=1,898 cells/mL and PMN% >=68.0 were identified as the optimal cutoffs that predicted failure following reimplantation.
DISCUSSION AND CONCLUSION: To our knowledge, this is the largest study to date to identify cutoffs for WBC count and PMN% in predicting failure after reimplantation in a multicenter cohort of patients undergoing two-stage exchange. Although these tests could not predict treatment outcomes with definitive accuracy, the combination of WBC and PMN%, at cutoffs of 1,898 cells/mL and 68%, respectively, appears to have the best predictive value in identifying patients at risk of failure following completion of a two-stage protocol.