

Admission White Blood Cell Count Improves Prediction of Delayed Cerebral Ischemia Following Aneurysmal Subarachnoid Hemorrhage

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Introduction

Immune dysregulation has long been implicated in the development of DCI following aneurysmal subarachnoid hemorrhage (aSAH). Our objective was to determine the relationship of inflammatory cell biomarkers with delayed cerebral ischemia (DCI).

Methods

We evaluated 849 aSAH patients who were enrolled into a prospective observational cohort study and had a white blood cell (WBC) differential obtained within 72 hours of bleed onset.

Results

After controlling for clinical grade ($p < 0.001$), thick SAH on admission CT ($p = 0.002$), and clipping aneurysm repair ($p < 0.001$), WBC count $> 12.1 \times 10^9/L$ (OR 1.2; 95%CI: 1.1-1.3, $p < 0.001$) was the strongest CBC predictor of DCI followed by a neutrophil-lymphocyte ratio > 10.75 (OR 1.5; 95%CI: 1.1-2.2, $p = 0.02$). A significant interaction between clinical grade and WBC count (OR 1.0, 95%CI: 0.9-1.0, $p = 0.002$) revealed that good-grade patients with elevated WBC counts (49%: 273/558) had increased odds for DCI indistinguishable from poor-grade patients. Multivariable Cox regression also showed that elevated WBC counts in good-grade patients increased the hazard for DCI to that of poor-grade patients (HR 2.1, 95%CI 1.3-3.2, $P < 0.001$). ROC curve analysis of good-grade patients revealed that WBC count (AUC: 0.63) is a stronger DCI predictor than modified Fisher Score (AUC: 0.57) and significantly improves multivariable DCI prediction models ($Z = 2.0$, $P = 0.02$, AUC: 0.73; PPV: 34%; NPV: 92%).

Conclusions

Good-grade patients with early elevations in WBC count have a similar risk and hazard for DCI as poor-grade patients. Good-grade patients without elevated WBC may be candidates to be safely downgraded from the ICU, leading to cost savings for both patient families and hospitals.

Learning Objectives

Understand the effect of admission WBC as a surrogate marker of underlying inflammation following SAH in predicting DCI

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