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Hematologic Inflammation Indices in Emergency CIN Risk Stratification in patients with Acute Coronary Syndrome-promise, Perspective, and Prudence

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In the rapidly evolving and high-stakes environment of the emergency department (ED), clinicians often confront the dual imperatives of diagnostic efficiency and clinical prudence, particularly in patients presenting with acute coronary syndrome (ACS). The integration of contrast-enhanced imaging or percutaneous coronary intervention into the diagnostic and therapeutic algorithms for ACS has become ubiquitous. However, this advancement carries a known iatrogenic risk: contrast-induced nephropathy (CIN) (1). The need to balance life-saving interventions against preventable complications such as CIN underscores the necessity for rapid, cost-effective and accessible risk stratification tools.

CIN has been defined as the impairment of renal function gauged as either a 25% rise in serum creatinine from baseline or an increase of 0.5 mg/dL (44 µmol/L) in absolute serum creatinine value within 48-72 hours following intravenous contrast administration (2). The prevalence of diabetes and chronic kidney disease is rising by the day. Both of these are risk factors for acute kidney injury after cardiac catheterization and percutaneous coronary interventions. Based on current definitions the incidence of CIN ranges from 2% to 30%. Most cases are completely reversible within two to four weeks (3).

In this context, a study published in this issue, offers valuable insights by evaluating the prognostic utility of hematologic inflammation indicesnamely neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR), and lymphocyte-to-monocyte ratio (LMR) in predicting CIN among ACS patients in the emergency setting. This retrospective observational study of 814 patients identifies a modest but clinically relevant role for these biomarkers in early CIN risk stratification, with an emphasis on accessibility and rapidity.

What sets this study apart is not merely its focus on NLR, PLR, and LMR parameters that are increasingly recognized in the literature (4-7) but the real-world application in an emergency care context, where complex risk scoring systems often fall short due to time constraints or incomplete data. The authors aptly point out that most existing CIN prediction models (e.g., Mehran score) (8) are resource- and time-intensive, making them less practical in emergent settings. In contrast, inflammation indices derived from routine complete blood count offer a rapid, low-cost, and universally available alternative. The study's findings are notable. Patients who developed CIN (10.9% of the cohort) were significantly older and had higher NLR and PLR values, and lower LMR. Age >64 had the highest area under the ROC curve [area under the curve (AUC): 0.697], followed by NLR >5.2 (AUC: 0.615), PLR >137 (AUC: 0.590), and LMR <2.0 (AUC: 0.578). Importantly, NLR showed the highest specificity (84%), and LMR exhibited the highest sensitivity (86%) a compelling combination that underscores their potential complementary utility in ruling in or ruling out CIN risk.

Despite their statistical significance, the relatively modest AUC values of these markers underscore an important caveat: they are

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not definitive diagnostic tools, but rather adjunctive indicators. Their true strength may lie in their negative predictive value high across all indices which allows clinicians to confidently rule out CIN in low-risk patients and potentially reduce unnecessary testing, delays, or interventions.

Furthermore, these biomarkers may serve as a screening step prior to deploying more complex risk scores or initiating nephroprotective strategies, such as hydration protocols or minimizing contrast volume. The study thus aligns with the evolving concept of tiered risk assessment, where readily available data triage patients into different levels of monitoring or intervention intensity.

The study is grounded in a biologically plausible framework. Inflammation plays a central role in CIN pathogenesis, primarily through endothelial dysfunction, oxidative stress, and ischemic injury. NLR, PLR, and LMR are surrogate markers of this inflammatory milieu. Elevated NLR reflects neutrophilia and lymphopenia, both indicators of stress and systemic inflammation. A high PLR, meanwhile, suggests a pro-thrombotic, pro-inflammatory state, while a low LMR reflects monocytosis and suppressed adaptive immunity, both of which are implicated in tissue injury and impaired renal perfusion.

Like all retrospective single-center studies, this investigation is not without limitations. The absence of data on contrast type and volume, hydration status, and nephroprotective measures introduces potential confounding. Moreover, the use of only baseline values of the inflammatory markers overlooks the dynamic nature of inflammation, especially in acute settings like ACS. Nonetheless, the authors appropriately acknowledge these limitations, and their meticulous data screening and exclusion criteria lend credibility to their findings.

This study lays the groundwork for prospective, multicenter investigations that can validate these findings across diverse populations and healthcare systems. Future research should aim to:

- Integrate these hematologic indices into multivariable CIN prediction models.

- Examine serial measurements of NLR, PLR, and LMR for dynamic risk stratification.

- Evaluate the cost-effectiveness of using these markers in ED workflows.

Additionally, studies comparing these inflammatory indices with established scoring systems (e.g., Mehran, AKI risk index) could determine whether hybrid models offer improved performance.

Conclusion

This study provides timely and actionable insights into the use of inflammatory hematologic indices for CIN risk prediction in ACS patients undergoing contrast-enhanced procedures. While not definitive on their own, NLR, PLR, and LMR serve as practical, rapid-access tools that can assist emergency physicians in early decision-making. Their incorporation into clinical practice could enhance patient safety, optimize resource use, and support individualized care core pillars of modern emergency medicine.

As we continue to seek precision in patient care without compromising speed or simplicity, this study reminds us that sometimes, the answers lie not in more complexity, but in better use of what's already in front of us.

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