See Article page 1165.

Commentary: Preventing postoperative acute kidney injury starts with identifying actionable intermediates?

Victor A. Ferraris, MD, PhD

In this issue of the *Journal*, Tian and colleagues¹ address the early postoperative prediction of acute kidney injury (AKI) after coronary artery bypass grafting (CABG). The authors point out that urinary and serum creatinine levels are poor early indicators of AKI, which prompted their comprehensive evaluation of early indicators of AKI after cardiac operations. They used measurements of postoperative urinary metabolites, including analysis of urine chemistry with liquid chromatography–mass spectrometry. They defined 5 urinary metabolites that had predictive value for defining early AKI after CABG. A panel of these 5 urinary metabolites identified patients who developed early-stage postoperative AKI.

The authors analyzed 159 patients undergoing CABG using sophisticated analytic techniques, including liquid chromatography–mass spectrometry, to measure urinary metabolites early after CABG. They identified 55 patients with postoperative AKI of varying severity and identified 5 of 28 urinary metabolites that provided a good early prognostic indication of postoperative AKI. They compared the predictive ability of these 5 metabolites with that of traditional postoperative clinical factors known to be correlated with AKI. They used decision-curve analyses to compare the accuracy of their prediction model for postoperative AKI and found a “superior net benefit” of their prediction model based on these 5 urinary

CENTRAL MESSAGE

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metabolites. Their findings suggest that urinary metabolite screening may have clinical value in the early prediction of postoperative AKI.

Numerous recent studies suggest that postoperative AKI is associated with worse outcomes after cardiac operations. Despite this known prevalence, current studies have not shown a reduced development of AKI after cardiac operations, especially after those operations with above-average risk.²⁻⁵ Patients who require postoperative angiography, for whatever reason, are at especially high risk of postoperative AKI.⁶ Pediatric patients undergoing cardiac operations are not spared from this relationship between AKI and prevalence of worse cardiac surgical outcomes.⁷ Furthermore, recent investigations have identified various urinary and blood biomarkers associated with an elevated risk of AKI after cardiac operations.^{2,8,9} The results reported by Tian and colleagues amplify these relationships between AKI and these blood and urine biomarkers.

The missing factor in this relationship between cardiac operations and AKI is not a problem in understanding the risks of AKI, but rather a limited number of reproducible and effective action plans to reduce the occurrence of AKI in at-risk postoperative patients. The literature addressing interventions to limit postoperative AKI is abundant and relies on well-known interventions. There is no “magic bullet” with proven efficacy to reduce AKI in a reliable and uniformly effective manner. Some authors suggest that adherence to the KDIGO (Kidney Disease Improving Global Outcomes) bundle, consisting of optimization of volume status and hemodynamics, functional hemodynamic monitoring, avoidance of nephrotoxic drugs, and

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prevention of hyperglycemia in high-risk patients, provides a benefit in reducing postoperative AKI.¹⁰

A recent meta-analysis offers some hope. In a meta-analysis of interventions aimed at limiting renal injury in surgical patients, Pathak and colleagues¹¹ suggested that no single intervention works. Rather, what works is a comprehensive patient assessment and a broad-based intervention approach with both renoprotective and pharmacologic interventions using agents and interventions with some evidence of efficacy in AKI prevention. The article by Tian and colleagues offers a starting place for a comprehensive approach to limiting AKI after cardiac operations, but much more work is needed to develop a broad-based comprehensive intervention approach to reduce post-cardiac surgery AKI. Unfortunately, the authors do not outline actions that can be taken to reduce AKI, but nonetheless, their work is a necessary first step in the progression to AKI avoidance. Preventing postoperative AKI starts with identifying early intermediaries of AKI and defining actionable intermediate steps to avoid progression to AKI. This study represents a first step in this process.

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