Redefining kidney disease progression after cardiac surgery: Now what?

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Acute kidney injury (AKI) is a well-known complication in perioperative cardiac critical care, with an appreciable impact in morbidity and mortality. Deservedly so, it has received pertinent attention in its recognition as a key quality performance measure in cardiac surgery by the Society of Thoracic Surgeons and endorsement by the National Quality Forum. Despite the acknowledgement of the importance of AKI, and efforts to prevent and treat renal failure in the cardiac surgical patient, the spectrum of renal disease progression after AKI in this patient population is poorly understood and nebulously defined at best. After multiple attempts to improve the definition of kidney disease and to describe its evolution, a consensus has been reached on creating standard definitions of AKI, chronic kidney disease (CKD), and the state in between. In the Kidney Disease Improving Global Outcomes AKI guidelines, this transient disease state has been designated as acute kidney disease (AKD), which is specifically defined as structural kidney damage for less than 3 months after AKI, the time marker for CKD, with functional damage evidenced by a glomerular filtration rate of less than 60 mL/min/1.73 m² for less than 3 months or a decrease in glomerular filtration rate of at least 35% or increase in serum creatinine by more than 50% for less than 3 months. This designation was made in an effort to define the missing link between AKI and CKD and possibly to encounter and understand reversibility. Further characterization of AKI as transient (<48 hours) versus persistent (48 hours-7 days) is also gaining momentum, because the window for recovery is small.

In their article in this issue of the Journal, Mizuguchi and colleagues have sought to narrow this knowledge gap by using these definitions to understand the frequency and impact of AKD in a large, retrospective, multiyear observational study of more than 10,000 adult cardiac surgical patients at a single institution. They found that at baseline, 68% (n = 6952) of the entire cohort had no known kidney disease and 32% (n = 3282) had preexisting CKD. Of the entire cohort, 20.5% (n = 2095) had serum creatinine values obtained between 2 and 4 weeks after the index cardiac surgery. This last subgroup was the one used for the analysis to define presence of AKD. As expected, the AKI rate was lower among the patients with normal baseline kidney function (25.4%; n = 303) than among the patients with preexisting CKD (33.2%; n = 299). Nevertheless, the frequency of AKD was similar between the groups (4.4% vs 4.8%; P = .8), regardless of the presence of baseline kidney disease. Importantly, Mizuguchi and colleagues found that there was a steep graded prediction of developing AKD with higher AKI stages during the index admission, demonstrating that the higher the AKI stage, the higher the risk of development of AKD and subsequent CKD or need for renal replacement therapy. Moreover, the mortality was significantly higher among the patients who had AKD develop, regardless of baseline renal function. Similarly, the need for renal replacement therapy was higher among the patients who had AKD develop in both groups, but in a much more prominent fashion in the baseline CKD group, demonstrating the high-risk characteristics of these patients.

This study of Mizuguchi and colleagues provides a framework for further research in understanding the progression of kidney disease after cardiac surgery. As an observational retrospective study, there are many limitations, including the fact that the analysis was performed on only 20.5% of the study population and the assumption...
that the patients who did not have creatinine measured at weeks 2 through 4 (79.5%) were healthier and did not require close follow-up. This represents a selection bias that Mizuguchi and colleagues\(^5\) acknowledge in their article; they therefore provide supplemental information that includes a full analysis of the entire cohort. Despite its inherent limitations, this study brings a provocative new outlook, framework, and definition of renal disease in the cardiac surgical patient that we can use to identify patients at risk, such as persistent AKI beyond 48 hours, so that we can follow them up closely, give them timely interventions with potential nephrotoxicity, and forge new alliances with nephrology that go beyond the initiation of renal replacement therapy and extend to collaboration on prevention and multifaceted renal recovery.

References