Prognostic implications of baseline NT-proBNP before cardiac surgery

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Acute kidney injury (AKI) is a common but serious complication of coronary artery bypass graft (CABG) surgery, with a reported incidence of 3% to 30% depending on the definition used, and is associated with increased short-term morbidity and mortality.¹⁻³

In their article in this issue of the *Journal*, Belley-Cote and colleagues⁴ define postoperative AKI according to Kidney Disease: Improving Global Outcomes Definition and Staging (KDIGO) criteria,⁵ using the maximal change in serum creatinine (sCr) during the first 7 postoperative days compared with the preoperative baseline values. AKI was also defined by either of the following: an increase in sCr ≥ 0.3 mg/dL within 48 hours or an increase in sCr ≥ 1.5 times baseline known or presumed to have occurred within the previous 7 days. Moreover, AKI was staged for severity according to the following criteria: stage 1, increase in sCr ≥ 0.3 mg/dL or to 1.5 to 1.9 times baseline; stage 2, increase in sCr to 2.0 to 2.9 times baseline; stage 3, increase in sCr to 3.0 or more times baseline, increase in sCr to ≥ 4.0 mg/dL, or initiation of renal replacement therapy.

There is no single mechanism that explains cardiac surgery-associated renal injury. It is the result of the interaction of a number of factors,⁶⁻⁸ including age, sex, diabetes, poor cardiac function, hypertension, renal dysfunction, use of insulin, preoperative renal dysfunction, contrast agents used for coronary angiography within 7 days of CABG, use of cardiopulmonary bypass, and intraoperative transfusion of packed red blood cells. These factors have been identified as independently associated with an increased risk of postoperative AKI in patients who underwent CABG.

The numerous underlying mechanisms that possibly could induce renal damage include contraction of renal blood vessels, ischemia-mediated oxidative stress, and cytotoxic effects.^{3,9} Most of the known risk factors are unmodifiable.^{10,11} Nonetheless, control of modifiable risk factors can reduce the occurrence of AKI.

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Central Message

NT-proBNP determination before cardiac surgery provides us a better bedside prognostic information than many other parameters.

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Belley-Cote and colleagues⁴ report data from a prospective multicenter observational study of a large cohort of patients at high risk for AKI following cardiac surgery. They used the KDIGO criteria for assessing renal dysfunction. They also described perioperative biomarker changes associated with the development of severe AKI and 1- to 3-year all-cause mortality. Their work in this area represents a very important contribution.

One of the authors' main points regarding the AKI associated with cardiac surgery, that should be worthy of the reader's attention, is that a simple, routine diagnostic test—NT-proBNP—performed before surgery provides better prognostic information than many other parameters. NT-proBNP is a predictor of complications after cardiac surgery, and the role of preoperative BNP in predicting mortality has been described previously.¹² However, a strength of the present study is that it provides additional, almost bedside information regarding perioperative events. The authors confirm the results of previous studies,¹³ but also provide direct comparisons of different biomarkers.

Surely, renal function is an important predictor for patients referred for cardiac surgery. Both baseline renal function and the development of renal failure are important predictors of outcome and could modify most of the biomarkers. Various scoring systems, such as EuroSCORE, include renal function to stratify preintervention risk. AKI has been identified as one factor to keep in mind when referring a patient for cardiac surgery, especially if on-pump surgery will be performed. In this context, any useful information, especially if it has bedside usefulness, regarding perioperative risk should be considered relevant. In this analysis, the authors affirm that NT-proBNP provides better prognostic information than

CK-MB or troponin levels. Changes in this biomarker likely are not as suitable for renal impairment as other biomarkers. The authors have proposed that the higher the preoperative NT-proBNP, the greater the risks of AKI and mortality. Preoperative NT-proBNP was independently associated with the increased incidence of postoperative AKI and 1- to 3-year mortality.

Some questions remain to be answered by the authors, however. First is an explanation of why CK-MB and hsTnT were not associated with renal impairment or 1-year mortality but were associated with 3-year mortality. Second, NT-proBNP and hsTnT are commonly affected by acute coronary syndromes and congestive heart failure, but the number of patients with these disorders was not clear. Also missing is data on the functional class or baseline congestive heart failure symptoms of patients in the preoperative and postoperative periods.

In summary, Belley-Cote and colleagues⁴ have identified the potential usefulness of NT-proBNP in providing prognostic data for patients who have undergone CABG. These preliminary observations should be further assessed in studies exploring the mechanisms and pathophysiology underlying this effect. In addition, future studies should investigate the clinical efficacy of this therapy.

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