CORRESPONDENCE

Use of early postoperative serum creatinine elevation to identify acute kidney injury after cardiac surgery

Hui-Xian Li, MD · Fu-Shan Xue, MD · Ya-Yang Liu, MD

Received: 11 July 2017 / Revised: 12 July 2017 / Accepted: 20 September 2017 / Published online: 25 September 2017
© Canadian Anesthesiologists' Society 2017

To the Editor,

We read with interest the article by Karkouti *et al.*¹ on assessing the use of early postoperative creatinine elevation to identify acute kidney injury (AKI) after cardiac surgery. The AKI was defined based on the consensus recommendations of the AKI Network (AKIN) for serum creatinine (sCr) criteria. The early postoperative sCr change ($\Delta\text{Creat}^{\text{ratio}}$) – denoted as the ratio of postoperative sCr (measured within 30 min of arrival in the intensive care unit)/preoperative sCr – was used as a primary endpoint.

It was unclear, however, whether the sCr measured during the early postoperative period had been corrected based on the perioperative fluid balance. Available evidence suggests that not adjusting sCr for the fluid balance could underestimate the true incidence of AKI after cardiac surgery because a positive perioperative fluid balance could dilute sCr.² Furthermore, in Karkouti *et al.*'s study, the threshold of $\Delta\text{Creat}^{\text{ratio}} > 1.3$ was used to identify postoperative AKI. In contrast, Ho *et al.*³ demonstrated that a smaller early postoperative sCr change (i.e., $\geq 10\%$ sCr increase) could significantly predict a higher AKI risk, and a $\geq 10\%$ decrease could significantly predict a lower AKI risk compared with the reference category.

In a sensitivity analysis, Karkouti *et al.* evaluated the relation of the $\Delta\text{Creat}^{\text{ratio}}$ with AKI stage 1 in the

development and validation sets but not the relations of the $\Delta\text{Creat}^{\text{ratio}}$ with AKI stages 2 and 3. It has been shown that AKI stages 2 and 3 incidences are lower than that of AKI stage 1 and are more significantly associated with short- and long-term adverse outcomes after cardiac surgery.⁴ It is thus generally believed that the need for a tool to predict the more severe categories of AKI is important for the patient's prognosis and long-term outcomes after cardiac surgery.⁵ Thus, we argue that the predictive value of the $\Delta\text{Creat}^{\text{ratio}}$ for AKI stages 2 and 3 also require further validation in the development and validation sets.

Finally, several models are available for predicting AKI following cardiac surgery that are based on readily-available clinical information before and during surgery. They can be easily applied at the bedside and provide a simple, interpretable estimation of risk. Furthermore, the best-validated models can effectively predict severe AKI that would require dialysis following cardiac surgery, such as the Cleveland Clinic model and the Mehta model.⁵ In Karkouti *et al.*'s study, the sensitivity, specificity, and positive and negative predictive values for using a threshold ratio of $\Delta\text{Creat}^{\text{ratio}} > 1.3$ for predicting postoperative AKI in the development set were 20% (95% confidence interval [CI], 16 to 24), 99% (95% CI, 99 to 99), 68% (95% CI, 59 to 76), and 93% (95% CI, 92 to 93), respectively. As Karkouti *et al.*'s study design did not include evaluation of the discrimination ability of $\Delta\text{Creat}^{\text{ratio}}$ compared with the best-validated clinical models to identify the patients who suffer AKI, an important question remains unanswered: Does the information gained from the $\Delta\text{Creat}^{\text{ratio}}$ facilitate early identification of AKI after cardiac surgery as well as, or better than the clinical models?

This letter is accompanied by a reply. Please see Can J Anesth 2018; 65: this issue.

H.-X. Li, MD · F.-S. Xue, MD (✉) · Y.-Y. Liu, MD
Department of Anesthesiology, Plastic Surgery Hospital,
Chinese Academy of Medical Sciences and Peking Union
Medical College, Beijing, China
e-mail: xuefushan@aliyun.com; fushan.xue@gmail.com

Competing interests None declared.

Editorial responsibility This submission was handled by Dr. Philip M. Jones, Associate Editor, *Canadian Journal of Anesthesia*.

References

1. Karkouti K, Rao V, Chan CT, Wijeyesundera DN, TACS Investigators. Early rise in postoperative creatinine for identification of acute kidney injury after cardiac surgery. *Can J Anesth* 2017; 64: 801-9.
2. Moore E, Tobin A, Reid D, Santamaria J, Paul E, Bellomo R. The impact of fluid balance on the detection, classification and outcome of acute kidney injury after cardiac surgery. *J Cardiothorac Vasc Anesth* 2015; 29: 1229-35.
3. Ho J, Reslerova M, Gali B, et al. Serum creatinine measurement immediately after cardiac surgery and prediction of acute kidney injury. *Am J Kidney Dis* 2012; 59: 196-201.
4. Helgadottir S, Sigurdsson MI, Palsson R, Helgason D, Sigurdsson GH, Gudbjartsson T. Renal recovery and long-term survival following acute kidney injury after coronary artery surgery: a nationwide study. *Acta Anaesthesiol Scand* 2016; 60: 1230-40.
5. O'Neal JB, Shaw AD, Billings FT 4th. Acute kidney injury following cardiac surgery: current understanding and future directions. *Crit Care* 2016; 20: 187.