Proteinuria is an equivalent marker for low renal function

Antonio Miceli, MD, PhD

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Acute kidney injury (AKI) occurs in 3% to 30% of patients undergoing cardiac surgery and is associated with increased mortality, morbidity, prolonged hospital stay, and increased health care costs. In the last years, several risk models have been developed to identify potential risk factors for postoperative AKI, and among these preoperative renal function has been considered one of the most important predictor of adverse outcomes.¹ The identification of new risk factors represents a step forward toward a better risk stratification that can help optimize therapeutic strategies for the prevention of AKI and its consequences. Recently, proteinuria has been recognized as a powerful measure of kidney disease, providing relevant prognostic information for postoperative AKI in addition to estimated glomerular filtration rate (eGFR).²

In this issue of the *Journal*, Li and colleagues³ add evidence that any grade of preoperative proteinuria detected with a urine dipstick test is strongly associated with all stages of postoperative AKI among patients with preserved eGFR. They report a study cohort of approximately 1200 patients with preserved eGFR (80 ± 13 mL/min/1.73 m²) who underwent cardiac surgery from 2003 to 2007. AKI was defined according to Acute Kidney Injury Network criteria, and proteinuria was graded 1+ (30-100 mg/dL), 2+ (100-300 mg/dL) and 3+ (>300 mg/dL). Interestingly, among patients undergoing surgery, proteinuria was present in 23.4%, and 50% of these had AKI develop. After adjustment for baseline characteristics and eGFR, patients with proteinuria 1+, 2+, and 3+ had mean of 4-, 9-, and 9-fold increased risks of postoperative AKI, respectively. The report of Li and colleagues,³ which relies on large patients numbers, gives an important message: even in the presence of a normal eGFR measurement, one-fourth of patients are still at risk, and the probability of AKI development increases with increasing severity of proteinuria. The use of the urine dipstick, a simple, cheap and

widely available diagnostic test, may identify and unmask a consistent group of patients otherwise considered “normal” from a renal point of view. Potential limitations, however, should be recognized.

From a pathophysiologic point of view, the presence of protein in the urine reflects a size-selective dysfunction of the glomerular barrier or tubulointerstitial disorder and is often associated with hypertension, diabetes, or glomerulopathy. In this setting, patients with documented proteinuria have less physiologic adaptability and are less able to tolerate kidney hemodynamic changes and other nephrotoxic insults.² AKI is a multifactorial disease and depends on many preoperative, intraoperative and postoperative variables. Risk factors such as hypertension, preoperative medications, previous heart surgery, perioperative myocardial infarction, endocarditis, cardiogenic shock, prolonged cardiopulmonary bypass, intraoperative hypotension, and hemodilution are well-known predictors of worse renal outcomes; however, none of these variables were taken into account in a multivariable analysis.¹ In addition, no information is reported regarding the temporal relationship between coronary angiography and the timing of cardiac surgery. It has been suggested that a “double hit” on renal function in close succession increases the risk of AKI after cardiac surgery.⁴ Finally, although the study was performed on patients with preserved renal function (eGFR >60 mL/min/1.73 m²), 77% of them had mild renal dysfunction, with an eGFR between 60 and 90 mL/min/1.73 m². It is well known that a mild degree of renal dysfunction is an important predictor of AKI and others adverse outcomes in cardiac surgery.⁵

For the surgical community, the results of this study represent another important advance in the evaluation of perioperative risk stratification for renal outcomes and complications. An accurate assessment of proteinuria in the presence of preserved renal function might distinguish patients with occult renal disease at risk for AKI and provide a better risk stratification that can help to optimize therapeutic strategies for the prevention of AKI, just as for patients with low eGFR.

From the School of Clinical Science, University of Bristol, Bristol, UK and the Department of Cardiac Surgery, Istituto Clinico Sant' Ambrogio, Milan, Italy.

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Address for reprints: Antonio Miceli, MD, PhD, School of Clinical Science, University of Bristol, Bristol, BS2 8HW UK (E-mail: antonio miceli79@alice.it). *J Thorac Cardiovasc Surg* 2015;149:900-1

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