JACC: CARDIOVASCULAR INTERVENTIONS VOL. 11, NO. 11, 2018
© 2018 BY THE AMERICAN COLLEGE OF CARDIOLOGY FOUNDATION
PUBLISHED BY ELSEVIER

EDITORIAL COMMENT

Left Atrial Appendage

Unsuspected Connection With the Kidneys*

Joelle Kefer, MD, PhD

Acute kidney injury (AKI) was defined by the AKI Network (AKIN) as an abrupt (within 48 h) reduction in kidney function with an absolute increase in serum creatinine of ≥0.3 mg/dl, a percentage increase of serum creatinine ≥50%, or a reduction in urine output (oliguria <0.5 ml/kg/h) (1). The use of these AKI Network criteria was recommended in the Valve Academic Research Consortium-2 document (2) and are now well accepted in the interventional community, allowing a uniform diagnosis of this complex disorder, whose definition has evolved over the past decade.

The etiologies of AKI after transcatheter cardiac interventions are mainly related to contrast-mediated acute tubular necrosis. Contrast-induced nephropathy is the third leading cause of hospital-acquired acute renal failure, accounting for 10% of all cases (3). However, other recognized causes of AKI are hypotension, atheroembolisms, direct cytotoxic effect, and pre-existing chronic kidney disease. A correlation was demonstrated between the degree of atherosclerotic burden of the aorta and the incidence of AKI after transcatheter aortic valve replacement (4).

The impact of AKI on outcome was well described in several studies showing an increase of short- and long-term mortality, and a higher risk of bleeding, myocardial infarction, and dialysis (5–7). Therefore, risk scores were developed to predict the occurrence of this severe complication (8) including patient-related (age, diabetes, anemia, pre-existing renal or heart failure) and procedure-related (hypotension, use of intra-aortic balloon pump) criteria.

Left atrial appendage occlusion (LAAO) is a transvenous echo-guided procedure, without manipulation of catheters in the aorta, that can be performed with a low volume of contrast agent. A similar procedural safety was recently observed among patients with and those without pre-existing chronic renal failure included in the Amplatzer Cardiac Plug multicenter registry (9), with no need for new dialysis therapy in any patient.

SEE PAGE 1074

In this issue of *JACC: Cardiovascular Interventions*, Nombela-Franco et al. (10) reported an incidence of AKI at 9% after LAAO, mainly at stage 1, but 1.9% of them were at stage 2 or 3, with a need for new dialysis in 0.6% of cases. This is the first time that AKI after LAAO was specifically evaluated in a multicenter registry. This relatively high incidence of AKI could be explained by the population of patients (44% had pre-existing chronic kidney disease, 33% had diabetes, and 25% had peripheral vascular disease) and by procedural factors (mean contrast volume at 150 ml, 9% of combined procedures).

The authors showed nicely that the occurrence of AKI was an independent predictor of mortality and was associated with a higher rate of bleeding or embolic event, a longer hospitalization length, and a persistent loss of renal function at follow-up.

LAAO is a procedure offered in patients who are not good candidates for long-term anticoagulant therapy, mainly because of previous major bleeding. The noninferiority of LAAO versus anticoagulant in cardioembolic stroke prevention was demonstrated in randomized trials (11,12). The main interest of LAAO is the reduction of bleeding after anticoagulant interruption, while keeping a thromboembolic protection in patients with atrial fibrillation (9–13).

The higher incidence of hemorrhage after LAAO complicated by AKI could be a significant limiting

*Editorials published in *JACC: Cardiovascular Interventions* reflect the views of the authors and do not necessarily represent the views of *JACC: Cardiovascular Interventions* or the American College of Cardiology.

From the Cliniques Universitaires Saint-Luc, Division of Cardiology, University of Louvain, Brussels, Belgium. Dr. Kefer has reported that she has no relationships relevant to the contents of this paper to disclose.

ISSN 1936-8798/$36.00 https://doi.org/10.1016/j.jcin.2018.02.005

factor, reducing the positive impact on the outcome of patients undergoing this procedure because of bleeding under anticoagulants. This is one of the reasons to pay attention to this complication and to implement preventive actions. In fact, the best cure of AKI is to prevent its occurrence.

Measures such as N-acetylcysteine, statin or bicarbonate administration, hydration, nephrotoxic agents interruption (angiotensin-converting enzyme or angiotensin II inhibitors, diuretics) have been largely debated in the published data, but there is no consensus on the best strategy to apply such measures before intervention in patients at risk. During the procedure, hypotension should be avoided and the volume of contrast should be restricted to the minimum level.

Some cases of LAAO with zero contrast injection were described as a "nontouch technique" used among patients with thrombus in LAA (14). Three-dimensional transesophageal echocardiographic guidance or new image fusion technique should certainly be considered as useful tools for contrast media reduction during LAAO.

Renal failure increases the hemorrhagic risk under warfarin and is a relative contraindication for new oral anticoagulant use. LAAO is therefore a very attractive therapy for stroke prevention in these patients and should be compared with low-dose new anticoagulants in future randomized trials. The identification of factors predisposing to AKI and persistent renal damage after LAAO is thus of paramount importance. In the study by Nombela-Franco et al. (10), the only independent predictor of AKI was poor estimate glomerular filtration rate at baseline. This emphasizes the need for research on optimal protection for those patients with atrial fibrillation and kidney disease, who are at high risk of adverse events, stroke, and hemorrhage.

In conclusion, Nombela-Franco et al. (10) are the first to demonstrate the occurrence of AKI after LAAO, and highlight its negative impact on the outcome of patients in terms of survival, bleeding, and renal impairment at follow-up. In the future, the impact of preventive actions taken before intervention and the use of multimodal fusion imaging should be evaluated in subsequent studies. Similar to the other transcatheter cardiac interventions (e.g., aortic valve implantation, coronary angioplasty), LAAO may impair the kidneys. Physicians have to take this kidney-heart connection into account in their management.

ADDRESS FOR CORRESPONDENCE: Dr. Joelle Kefer, Cliniques Universitaires Saint-Luc, University of Louvain, Division of Cardiology, Avenue Hippocrate, 10-2881, 1200 Brussels, Belgium. E-mail: joelle.kefer@uclouvain.be.

REFERENCES

1. Mehta R, Kellum J, Shah S, et al. Acute kidney injury network: report of an initiative to improve outcomes in acute kidney injury. Crit Care 2007;11:R31.

2. Kappetein PA, Head SJ, Genereux P, et al. Updated standardized endpoint definitions for transcatheter aortic valve implantation: the Valve Academic Research Consortium-2 consensus document. J Thorac Cardiovasc Surg 2013;145:6–23.

3. Maeder M, Klein M, Fehr T, Rickli H. Contrast nephropathy: review focusing on prevention. J Am Coll Cardiol 2004;44:1763–71.

4. Van Rosendael PJ, Kamperidis V, van der Kley F, et al. Atherosclerosis burden of the aortic valve and aorta and risk of acute kidney injury after transcatheter aortic valve implantation. J Cardiovasc Comput Tomogr 2015;9:129–38.

5. James MT, Ghali W, Knudtson M, et al., Alberta Provincial Project for Outcome Assessment in Coronary Heart Disease (APPROACH) investigators. Association between acute kidney injury and cardiovascular and renal outcomes after coronary angiography. Circulation 2011;123:409–16.

6. Liotta M, Olsson D, Sartipy U, Holzmann M. Minimal changes in postoperative creatinine values and early and late mortality and cardiovascular events after coronary artery bypass grafting. Am J Cardiol 2014;113:70–5.

7. Nuis RJ, Rodés-Cabau J, Sinning JM, et al. Blood transfusion and the risk of acute kidney injury after transcatheter aortic valve implantation. Circ Cardiovasc Interv 2012;5:680–8.

8. Mehran R, Aymong E, Nikolsky E, et al. A simple risk score for prediction of contrast-induced nephropathy after percutaneous coronary intervention: development and initial validation. J Am Coll Cardiol 2004;44:1393–9.

9. Kefer J, Tzikas A, Freixa A, et al. Impact of chronic kidney disease on left atrial appendage occlusion for stroke prevention in patients with atrial fibrillation. Int J Cardiol 2016;207:335–40.

10. Nombela-Franco L, Rodés-Cabau J, Cruz-Gonzalez I, et al. Incidence, predictors, and prognostic value of acute kidney injury among patients undergoing left atrial appendage closure. J Am Coll Cardiol Intv 2018;11:1074–83.

11. Holmes D, Reddy V, Turi Z, et al. Percutaneous closure of the left atrial appendage versus warfarin therapy for prevention of stroke in patients with atrial fibrillation: a randomised non-inferiority trial. Lancet 2009;374:534–42.

12. Holmes DR Jr., Kar S, Price MJ, et al. Prospective randomized evaluation of the watchman left atrial appendage closure device in patients with atrial fibrillation versus long-term warfarin therapy: the PREVAIL trial. J Am Coll Cardiol 2014;64:1–12.

13. Tzikas A, Shakir S, Gafoor S, et al. Left atrial append- age occlusion for stroke prevention in atrial fibrillation: multicentre experience with the AMPLATZER cardiac plug. EuroIntervention 2016;11:1170–9.

14. Aytemir K, Aminian A, Asil S, et al. First case of percutaneous left atrial appendage closure by amulet device in a patient with left atrial appendage thrombus. Int J Cardiol 2016;223:28–30.

KEY WORDS kidneys, left atrial appendage, stroke