

## **Abstract**

**Background:** Recent studies revealed an association between kidney volume and function in particular settings such as kidney transplantation and transcatheter aortic valve implantation. We hypothesized that kidney volume was associated with the incidence of kidney-related adverse outcomes such as worsening renal function (WRF) in patients with acute heart failure (AHF).

**Methods:** This study was a single-center retrospective cohort study. It included patients admitted for AHF treatment between 2011 and 2021 and who underwent computed tomography (CT) that included images of the kidneys on the date of admission. We measured the volume of the right and left kidneys using dedicated volume analyzing software for 3D-CT (SYNAPSE VINCENT, Fuji Film, Tokyo, Japan) and determined the total kidney volume by adding the volumes of the left and right kidneys. We newly defined the composite of death from any cause, initiating renal replacement therapy, and WRF during hospitalization as Kidney-related adverse composite event (KACE). We conducted multivariate logistic regression analysis to evaluate the impact of KACE and each component of KACE adjusted for age, sex, body surface area, serum creatinine on admission date and the factors that were significantly associated with the incidence of KACE by bivariate analysis.

**Findings:** In the 229 patients enrolled in the analysis, death from any cause, initiating RRT, and WRF occurred in 30 (13.1%), 10 (4.4%), and 89 (38.9%) patients, respectively. It was found that small kidney volume ( $\leq 250$ ml) was independently associated with the increased incidence of KACE (odds ratio 6.10, 95% confidence interval [1.68-22.16],  $p=0.006$ ) and WRF (odds ratio 7.14, 95% confidence interval [1.91-26.73]  $p=0.004$ ). The area under the receiver operating characteristic curve for multivariate logistic regression analysis of KACE was 0.77.

**Conclusion:** Kidney volume on admission was independently associated with the increased incidence of kidney-related adverse outcomes during hospitalization in patients with AHF.