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Editorial

A Noteworthy Way to Predict Acute Decompensated Heart Failure in Patients With End-Stage Renal Disease

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▸ See the article "Increased Right Ventricular Pressure as a Predictor of Acute Decompensated Heart Failure in End-Stage Renal Disease Patients on Maintenance Hemodialysis" in volume 4 on page 154.

Heart failure (HF) is a major health-care problem because of its increasing prevalence, significant morbidity and high mortality.[1] Patients with end-stage renal disease (ESRD) on maintenance hemodialysis (HD) showed approximately 2 to 10 times higher cardiovascular mortality than those with normal kidney function.[2] About 25% of ESRD patients on dialysis develop HF and the 3-year survival rates of these patients were found to be less than 20%.[3][4] Poor volume control, difficulties in maintaining proper blood pressure, accelerated progression of coronary artery disease, anemia, electrolyte imbalance and uremic toxins are known to be the factors for developing HF in patients with ESRD.[5] Despite the advances in general HF management, clinical outcomes of these ESRD patients remain to be very poor.[6] If acute decompensated heart failure (ADHF) can be predicted earlier from the high-risk ESRD patients, their morbidity and mortality may be improved by modulating the risk factors of HF in advance. However, predictors of ADHF in patients with ESRD on HD have not been well studied.

In this issue of the journal, Kim et al.[7] reported that increased tricuspid regurgitation (TR) jet velocity is an independent predictor of ADHF event in ESRD patients on HD, on the other hand, the left ventricular ejection fraction (LVEF) or ratio of early mitral inflow velocity (E) to mitral annular early diastolic velocity (e′) fail to be independent predictors of ADHF. This finding suggests that increased TR jet velocity is more reliable parameter than LVEF or E/e′ in predicting acute decompensation in this study population. Although there were a number of potential limitations to their study, including the fact that it was a single-center retrospective study with a relatively small number of patients, it was the first report to demonstrate that increased TR jet velocity is an important echocardiographic parameter that can predict ADHF event in patients with ESRD on HD.

According to recent 2021 ESC guidelines for HF, natriuretic peptides testing is as important as echocardiographic findings during diagnostic workup for new onset acute HF.[8] The cut-off levels for acute HF were B-type natriuretic peptide (BNP) <100 pg/mL, N-terminal pro-B-type natriuretic peptide (NT-proBNP) <300 pg/mL, and mid-regional pro-atrial natriuretic peptide <120 pg/mL. However, elevated natriuretic peptide values could be associated with a wide range of cardiac and non-cardiac conditions including renal insufficiency. The concentration of NT-proBNP was higher than 300 pg/mL even in patients without ADHF event in this presented study. Thus, due to their false positive risks with patients with reduced renal function, the natriuretic peptides tests are less reliable for predicting or diagnosing acute HF in ESRD patients, while the TR jet velocity can be a reliable surrogate marker even in patients with ESRD.

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Renal retention of sodium and water is one of the main mechanisms of ADHF.[8] Because the capacity of sodium and water excretion is extremely low in patients with ESRD, they have increased risks of developing ADHF than individuals with normal kidney function. It seems to be obvious that greater fluid accumulation leads to greater hemodynamic burden on HD patients. However, weight gain between HD sessions is less than 3kg and there was no significant difference in the weight gain between patients admitted with ADHF and those without ADHF in this presented study. Therefore, weight gain between HD sessions neither represents hemodynamic burden of HD patients nor predicts ADHF events in patients with ESRD. A considerable proportion of tricuspid regurgitation seen in HD patients is volume dependent and may be related to hemodynamic stress.[9] In this respect, TR jet velocity and right ventricular systolic pressure may be regarded as predictors of ADHF in patients with ESRD.

Left ventricular (LV) dysfunction across the spectrum of LVEF is also a main mechanism of ADHF, and patients with LV dysfunction may have right ventricular (RV) dysfunction as well.[8] Because both LV systolic dysfunction and LV diastolic dysfunction are associated with development of ADHF, LVEF cannot predict ADHF events in ESRD patients independently. A previous study reported that RV dysfunction is independently associated with all-cause mortality in patients with ADHF and mild to moderate chronic renal insufficiency.[10] Increased TR jet velocity is noted in patients with RV dysfunction or pulmonary hypertension. Unfortunately, echocardiographic parameters that are required for assessing RV dysfunction such as tricuspid annular plane systolic excursion, RV fractional area change, and inferior vena cava diameter were not evaluated in this presented study. Alternatively, the peak systolic velocity of TR >2.8 m/s may be used for suggesting RV dysfunction or pulmonary hypertension.[11] ADHF event may be related to more than one mechanism, including increased hemodynamic burden, LV dysfunction regardless of ejection fraction, RV dysfunction, and pulmonary vascular abnormalities.

In conclusion, it is remarkable that this presented study was conducted to determine hemodynamic factors for predicting ADHF event in patients with ESRD. Further well-designed prospective studies are needed to verify the result of this study.

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