Preserved Right Ventricular Mechanics Is the Best Predictor of Response to Vasodilator Therapy in Patients with Acutely Decompensated Heart Failure

Background: Acutely decompensated heart failure (ADHF) is a frequent complication in patients with advanced chronic heart failure (CHF) and a major cause of morbidity and mortality. The determinants of response to vasodilator therapy (VDT) with nitroprusside in this population are still unclear. We sought to study the role of right ventricular (RV) mechanics as predictor of response to VDT with nitroprusside in patients with ADHF.

Methods: 32 patients with ADHF (cardiac index [CI] < 2.0 lts/m2 and elevated filling pressures) who were admitted to the heart failure ICU for Swan-Ganz guided VDT with nitroprusside, underwent baseline echocardiographic evaluation. RV peak systolic longitudinal strain by speckle-tracking was measured as the average of the basal, mid, and apical segment of the RV free wall. Other conventional parameters of RV function (RV fractional area change, RV myocardial performance index, tricuspid annular peak systolic excursion, tissue Doppler peak tricuspid annular systolic velocity) were measured for comparison. Patients were defined as non-responders to VDT if they developed hypotension or failed to increase the CI > 2.0 lts/m2 with treatment.

Results: In our study cohort (LV ejection fraction 26 ± 9%, CI 1.59 ± 0.2 lts/m2, pulmonary wedge pressure 29 ± 7 mmHg), the mean RV peak systolic strain was -13.6 ± 4.3%, and 31% of the patients were non-responders to VDT requiring the use of inotropes. In the univariate analysis, RV peak systolic strain was the only parameter of RV function that correlated with response to VDT. In the multivariate analysis, RV strain was the strongest independent predictor of response to VDT when adjusted for CI, RV stroke work index, pulmonary wedge pressure, right atrial pressure, systemic vascular resistance, pulmonary vascular resistance, and baseline mean blood pressure. A RV peak systolic strain value lower than -13% had a sensitivity of 88% and a specificity of 65% to predict response to VDT (OR 1.8, 95% CI 1.2-3.2, p=0.0003; area under the curve 0.89).

Conclusion: Our study suggests that RV systolic function assessed by RV mechanics is a major determinant of response to VDT with nitroprusside in patients with acutely decompensated heart failure.