Editorial

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Right Ventricular Longitudinal Strain: A Target Indicator in the Treatment of Pulmonary Arterial Hypertension

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Pulmonary arterial hypertension (PAH) is a syndrome in which pulmonary arterial obstruction increases pulmonary vascular resistance (PVR) leading to right ventricle (RV) failure. Progression and survival of patients with PAH are related to the ability of the RV to adapt to the chronically elevated pulmonary artery pressure (PAP),[1] hence, RV function is an important determinant of prognosis in PAH. However, noninvasive assessment of RV function is often limited by complex geometry and poor endocardial definition. Conventional parameters such as tricuspid annular plane systolic excursion <17 mm and RV fractional area change <35% are used to evaluate RV function and the current guideline recommends these parameters for estimating RV function.[2-4] However, these measurements have limitations to represent the global function of RV due to its complex geometry.[5][6]

Novel techniques such as RV longitudinal strain or RV myocardial performance index can evaluate RV function.[7][8] The longitudinal muscle fiber orientation of RV results in systolic motion, which is largely in the longitudinal plane with the RV base moving toward the apex. Therefore, RV longitudinal strain assessed with speckle tracking is relatively angle independent and provides more global function assessment.[9] A recent study showed that RV longitudinal peak systolic strain is a significant prognostic determinant in patients with PAH.[10] However, published reports on the accuracy of 2-dimensional echocardiography-derived RV strain against an independent reference in PAH patients are limited. Freed et al.[11] showed that RV longitudinal strain assessed with 2-dimensional speckle tracking provides a good alternative for cardiovascular magnetic resonance-derived RV ejection fraction in patients with PAH.

Recently, Park et al.[12] reported that baseline RV longitudinal strain correlates with functional capacity (6-minute walking distance, r=-0.54, p<0.01), biomarker (Log_{BNP}, r=0.65, p<0.01) and invasive hemodynamic parameters (mean PAP, r=0.35, p<0.05; cardiac index, r=0.50, p<0.01; PVR, r=-0.45, p=0.01) by right heart catheterization in PAH patients. They also showed that RV longitudinal strain changes in parallel with the changes of invasively measured mean PAP and PVR; and the changes in RV longitudinal strain reflect changes in specific pulmonary vasodilator treatment during follow-up. These findings implicate that in addition to the prognostic value of single measurement of RV longitudinal strain, serial non-invasive echocardiographic assessment of RV longitudinal strain may predict clinical deterioration in patients with PAH after initiating medical therapy. Although this retrospective and observational study had major limitations with relatively small numbers of PAH patients, this work has valuable clinical meaning, because one of the most important issues in PAH is to resolve the discrepancy between the prognosis of patients with PAH and PVR with modern pharmacotherapy. RV function can deteriorate in patients with PAH, despite the apparent success of therapy indicated by the reduction in PVR; furthermore, a deterioration of RV function is associated with a poor outcome, irrespective of the trends in PVR.[13] Accordingly, the staging of patients by degree of RV longitudinal strain reduction might be useful in predicting survival in patients before and after initiation of medical therapy. In addition, RV longitudinal strain is a potential non-invasive target indicator in the treatment of PAH.

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