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Editorial

Right Atrial Mechanics on Speckle-Tracking Echocardiography: Clinical Implications in Children

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▸ See the article "Right Atrial Strain in Preterm Infants With a History of Bronchopulmonary Dysplasia" in volume 30 on page 112.

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Although the right atrium (RA) is often regarded as the ''forgotten chamber'' of the heart, it is a dynamic structure that assists with filling the right ventricle (RV). There is growing awareness of the importance of RA mechanics in the function of the RV and pulmonary vascular pathology. Analogous to the left-sided heart chambers where left atrial dilation and dysfunction is an early sign of left ventricular diastolic dysfunction, RA function may be a sensitive indicator of RV failure and pulmonary vascular disease.[1]

For the assessment of RA mechanics, strain imaging using speckle tracking echocardiography has emerged as a promising new tool. The current study by Kang et al.[2] represents one effort to apply strain imaging in the evaluation of right-sided heart dysfunction in children. They focused on potential of peak longitudinal RA strain measured by speckle-tracking echocardiography as an RV functional index in preterm infants with bronchopulmonary dysplasia. Throughout the phases of the cardiac cycle, RA has three functional components: 1) Reservoir function, storage of blood from the systemic venous circuit during ventricular systole when the tricuspid valve is closed; 2) Conduit function, passive blood emptying into the RV when the tricuspid valve is open; and 3) Booster pump function, atrial contraction in late diastole to complete ventricular filling.[3] Peak longitudinal RA strain, as adapted in their paper, reflects RA reservoir function. As the RA reservoir phase occurs during RV diastole, it seems logical that lower peak longitudinal RA strain may reflect abnormal myocardial relaxation and diastolic dysfunction of the RV.

As the authors described in their discussion, RA strain has been studied in adult patients with pulmonary arterial hypertension and right heart dysfunction.[4] In a study of 165 adult patients with precapillary pulmonary hypertension,[5] peak longitudinal RA strain <25% was associated with increased mortality; they speculated that peak longitudinal RA strain had additive prognostic usefulness to other clinical measures, including RV strain, RA area, and RA pressure.[5] Recent data by Richter et al.[6] also demonstrated that peak longitudinal RA strain is an estimate of RV diastolic function reflected in RV end-diastolic pressure and end-diastolic elasticity, and clinical worsening in adult patients with pulmonary hypertension.

Reflecting several pediatric studies, RA mechanics may also be of value in the pediatric population. Jone et al.[7] evaluated RA deformation properties in pediatric pulmonary

Journal of Cardiovascular Imaging JCVI

hypertension and demonstrated that RA pump function was preserved with pulmonary hypertension until the late stage of the disease; however, progressive worsening of RA reservoir and conduit functions was related to early changes in RV diastolic dysfunction. This study also showed that decreased RA reservoir function correlates with worse 6-minute walk test, higher biomarkers, and worse hemodynamics in pediatric pulmonary hypertension.[7]

Of course, some technical limitations need to be considered. First, there is no speckle tracking software specific to the RA; second, thinner myocardium can impair signal quality especially in the RA roof; and, finally, normal reference values have not been established in children yet. Aside from such technical barriers, the study of RA strain using speckle tracking echocardiography appears to be a promising alternative for the diagnosis of early RV diastolic dysfunction in the pediatric population.

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