

Editorial



Right Ventricular Performance in Uncontrolled Hypertensive Patients: 2D vs. 4D Echo Study

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Conflict of Interest

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Hypertension influences the diastolic function of the left ventricle (LV),^{1,2)} and these changes are ongoing and can eventually result in heart failure with systolic and/or diastolic dysfunction.³⁾ The spectrum of these changes keeps pace with similar changes in the right ventricle (RV) and ultimately affects the RV structure and function. As the authors mentioned in the discussion, there has been controversy about RV function changes in hypertensive patients. However, previous studies showed RV dysfunction in untreated or mildly hypertensive patients using mainly 2-dimensional (2D) echocardiographic study.⁴⁾ This study represented a real clinical situation because enrolled patients had already been prescribed and taken the medications for at least 30 months.

Accurate assessment of RV size and function is important for the management of various diseases, including congenital heart disease, pulmonary hypertension, myocardial infarction, heart failure, and pulmonary embolism. Therefore, an accurate and easily repeated noninvasive imaging modality for serial evaluation of patients would be crucial. However, noninvasive evaluation of RV structure and function based on 2D geometric modeling has been challenging due to its complex RV morphology consisting of the inflow tract, the infundibulum, and the apex, which are often not all visible simultaneously using 2D imaging techniques. The retrosternal location of the RV also leads to suboptimal image quality in 2D imaging. Additionally, RV myocardial fiber array is different from the LV giving rise to peristaltic contractile function. Echocardiography is the most commonly used imaging technique for the study of RV morphology, volume, function, and tissue characterization.^{5,6)} The accuracy of 2-dimensional echocardiography (2DE) is inferior to that of cardiac magnetic resonance imaging.⁷⁾ Because of the complex RV geometry, 2DE cannot capture RV inflow and outflow in the same image acquisition. Real-time 3-dimensional (3D) echocardiography, also named 4-dimensional (4D) echocardiography, is a more accurate and quicker method to assess RV volume and function than 2DE, but in some cases, this approach still poses some technical difficulties.⁸⁾

As the author mentioned, hypertensive patients should be assessed for right heart involvement as well as left heart.⁴⁾ Whether these right heart changes occur early, at the same time as left heart changes due to interdependence of the two structures, or whether it is a secondary phenomenon possibly related to pulmonary vascular changes remains to be proven by further

studies. For the evaluation of RV involvement in hypertensive patients, 4D echocardiographic assessment is more sensitive and comprehensive than 2D echocardiographic evaluation. In addition, newer imaging techniques, especially speckle-tracking-derived myocardial deformation imaging, have provided a new understanding of the effect of systemic hypertension on this previously neglected and unforgotten cardiac chamber.⁹⁾ However, much remains to be clarified concerning the exact underlying mechanisms, and as LV function is a critical determinant of RV function, RV evaluation should be reported in the context of a systematic analysis of LV indices. Advances in software and image analysis will make 3D echo the mainstay of future studies in RV structure and function. In the future, further evaluation is needed for RV involvement in a large number of hypertensive patients and to discuss the trajectory manner of hypertensive patients' disease continuum.

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