Editorial

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Echocardiographic Measurement of Left Atrial Strain as a Tool for Assessing Left Atrial Function and Geometric Change

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Refer to the page 311-318

The left atrium (LA) serves as a reservoir of blood draining from the pulmonary veins during ventricular systole, a conduit of blood during ventricular diastole, and a booster pump of blood flow during atrial contraction.[1] Normal LA function is important in maintaining adequate cardiac performance, and it becomes abnormal in various cardiac or extra-cardiac conditions.

The abnormality of LA function can induce geometric changes, which results in the increase of the size and volume of the LA, and it has been non-invasively assessed by measuring the LA size or volume by echocardiography. The previous studies have shown that the LA size or volume is a powerful predictor of cardiovascular outcomes in various cardiac diseases, and thus, can be used as an imaging biomarker of cardiovascular disease or outcomes.[2)3)]

Strain is a measure of deformation, and strain rate is a rate of such deformation. Strain echocardiography has been the most widely used tool to evaluate the ventricular myocardial mechanics in the field of echocardiography, during the last decade.[4] Since the normal longitudinal LA strain values were first described in 2006, recent studies have suggested that LA strain or strain rate can be measured either by a tissue Doppler image or 2 dimensional (2D) speckle tracking image based echocardiography, and these measurements are useful tools to evaluate the global or regional LA function.[5)6)] The measurement of LA deformation is known to be associated with left ventricular filling pressure[7] and the severity of chronic mitral regurgitation,[8] a predictor of successful outcomes or LA reverse remodeling after catheter ablation of atrial fibrillation.[9]

In this issue of the journal, Her et al.[10] released an interesting and valuable data regarding the usefulness of 2D-speckle tracking based LA strain measurement for the prediction of LA fibrosis in patients with mitral valve disease. According to their data, LA global strain was significantly correlated with the degree of LA fibrosis, regardless of age, underlying rhythm, and the presence or type of rheumatic valvular disease, and the degree of LA fibrosis on histopathologic analysis of the LA was a significant predictor of early and late LA reverse remodeling after mitral valve surgery. Kuppahally et al.[11] also demonstrated that LA strain and strain rate is significantly associated with LA wall fibrosis, as measured by the degree of delayed enhancement on cardiac MRI (CMR). These two studies might have complementary clinical significance. CMR is a better tool than that of LA biopsy in that CMR can evaluate the fibrosis of the entire LA wall, but this benefit of CMR is counterbalanced by its limitation of the delayed enhancement on CMR, which is an indirect measure of LA fibrosis, and it cannot accurately reflect or quantify the true LA wall fibrosis. In this point of view, the study of Her et al.[10] has its unique clinical significance in that their study adopted a better method, LA biopsy, than the CMR method to evaluate the degree of fibrosis. However, the study of Her et al.[10] also has important limitation in that LA biopsy was done in small portion of the LA wall, and thus, it could not reflect the degree of fibrosis of the whole LA wall. Despite its limitations of both studies, it seems reasonable to conclude that LA strain or strain rate would be a useful non-invasive tool to evaluate LA function, including the degree of wall fibrosis by the combination of the results of these studies. The study of Her et al.[10] also demonstrated that the degree of LA wall fibrosis was more severe, and the strain values were more severely decreased in patients with mitral stenosis (MS) than in mitral regurgitation (MR). These findings were quite similar to the previous observations of

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Shin et al.[12] in that the patients with MS have greater pathologic physiology of the LA than in patients with MR.

It is clear that the evaluation of LA function is clinically important, not only in the risk stratification, but also in the prediction of clinical outcomes in various cardiovascular diseases. With the technical advances of echocardiography and cardiac imaging, our ability or understanding to characterize and quantify the LA function is rapidly improving. The measurement of LA deformation by strain echocardiography seems to be a promising tool to evaluate LA function and hemodynamics, but the current status of the LA strain measurement is still a research tool before accumulating sufficient evidences.

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