

## Editorial



# Utility of D-shaped Left Ventricle and Mitral E/E' in Patients with Pulmonary Hypertension

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### Conflict of Interest

The authors have no financial conflicts of  
interest.

Pulmonary hypertension (PH) is a relatively common disease associated with high mortality and morbidity rates without prompt diagnosis and treatment.<sup>1)</sup> There are several etiologies of PH, of which left ventricular (LV) dysfunction (group 2 PH) is the most common.<sup>1)2)</sup> Echocardiography is the most frequently used first-line imaging study in the detection of PH. With echocardiography, we can acquire information about LV systolic function, LV diastolic function and right ventricular (RV) systolic function. There are several echocardiographic findings that can estimate pulmonary artery systolic pressure. Among them, D-shaped LV is one of echocardiographic parameters suggesting the presence of elevated RV pressure. An abnormal pressure gradient between LV and RV can lead to D-shaped LV. This can be calculated using the eccentricity index and is primarily used to separate patients with RV pressure from those with volume overload.<sup>3)</sup> We consider it is abnormal when the value is more than 1.0 and think the RV pressure overload. In patients with PH, the systolic eccentricity index could identify RV dysfunction.<sup>4)</sup>

In the evaluation of diastolic function, the ratio of mitral E velocity over mitral annulus E' velocity (E/E' ratio) is a well-validated marker of LV end-diastolic pressure and the most useful index in clinical practice.<sup>5)</sup> E/E' ratio is also a valuable tool in the evaluation of heart failure patients with preserved ejection fraction.<sup>5)6)</sup> In patients with PH, E/E' ratio is usually variable due to the diverse etiologies of PH. Because LV end-diastolic pressure should be theoretically normal in patients with group 1, 3, 4 and 5 PH, their E/E' ratio should be lower or normal than in group 2 (and in some patients with group 5 PH). Thus, we should consider the study population in the interpretation of degree of D-shaped LV and its relation to E/E'. In the current study, the authors showed a significant negative correlation between eccentricity index and E/E' ratio.<sup>7)</sup> Because this study included many patients at increased risk of group 1, 3 and 4 PH, there was a lower or normal range E/E' ratio, higher pulmonary artery systolic pressure and lower tricuspid annular plane systolic excursion (TAPSE) in patients with D-shaped LV.

One of the strengths of this article is that patients showed a significant negative correlation between E/E' ratio and pulmonary artery systolic pressure. Increased pulmonary artery systolic pressure can decrease venous return to the left atrium (LA) and does not increase E/E'

ratio as a result, especially in patients with normal LV filling. Also, decreased venous return to the LA subsequently impairs LV diastolic filling and distorted LV cavity geometry.

In contrast to this, in patients with group 2 PH, increased LA pressure as a result of impaired LV diastolic filling can elevate pulmonary artery systolic pressure via increased pulmonary vein pressure. In this situation, an elevated E/E' ratio and D-shaped LV can occur. However, the percentage of D-shaped LV might differ from that in group 1, 3, 4 and 5 PH patients.

Unfortunately, data on right heart catheterization (RHC) were not available in this study. Although Doppler estimation of pulmonary artery systolic pressure with tricuspid regurgitation (TR) velocity is the most widely utilized echocardiographic measurement, it has been demonstrated that estimation with TR yields inaccurate results.<sup>8)</sup> Thus, we use RHC data as a gold standard in the diagnosis of PH. It would be better if the authors used RHC data and evaluated the correlation between the eccentricity index and RHC data in these patients. It might be possible to demonstrate the clinical utility of the eccentricity index in the diagnosis of PH, especially in group 1, 3, 4 and 5 PH, with RHC data. Thus, further study will be needed to evaluate the clinical utility of eccentricity index and E/E' ratio in the diagnosis of PH.

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