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Editorial

Evaluation of Left Ventricular Volume: Which method Is Your Choice?

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▸ See the article "Comparison of Left Ventricular Volumes Measured by 3DE, SPECT and CMR" in volume 27 on page 200.

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Left ventricular (LV) volume is a basic parameter used to evaluate cardiac disease and a key index of treatment response. LV ejection fraction (EF) can be derived from LV systolic and diastolic volume (ESV and EDV) and is the most useful clinical parameter of LV function. Cardiac magnetic resonance imaging (CMR) has been considered the gold standard for evaluating LV volume because of its excellent resolution and volumetric methods when compared to echocardiography.[1)2)] However, the volumetric assumption in CMR is a disc summation method; thus, selection of the image plane can be a source of potential variation.[3)] Furthermore, cine CMR is not a real-time imaging technique, which means it provides limited information regarding arrhythmia. Evolution of three-dimensional echocardiography (3DE) has suggested that the ideal volume measurement is obtained by real-time full-volume imaging; however, the echocardiographic window and image quality remain an issue in echocardiography.[4)] Single photon emission computed tomography (SPECT) also adopts disc summation methods, although the spatial and temporal resolution is poor when compared to echocardiography or CMR. The advantage of SPECT is concomitant evaluation of myocardial perfusion and LV volume and EF. Therefore, when a clinician encounters LV volume and EF data obtained via SPECT, inter-exam variability between other modalities such as CMR or echocardiography should be considered.[5)]

In this issue of *Journal of Cardiovascular Imaging*, Beitner et al.[6)] compared measurement of LV volume using three different modalities: 3DE, SPECT, and CMR. They included patients with new-onset acute ST-elevation myocardial infarction (STEMI) treated with percutaneous coronary intervention. This population had regional wall motion abnormalities and optimal indications for volumetric assessment of LV volume. As a result, EDV and ESV measured by 3DE and SPECT were much smaller than those obtained via CMR. However, LVEF was similar when derived from EDV and ESV, as previously reported.[4)] Determinant factors for variation are including 1) LV outflow tract 2) discrimination of small trabeculation in LV endocardium (image quality issue) 3) software differences especially whether detecting papillary muscle and trabeculation border or not. In this study, the LV outflow tract was excluded in 3DE and SPECT measurement, but not in CMR. This explains the smaller volume measurement in 3DE and SPECT compared to CMR, and additional intrinsic limitations of 3DE and SPECT with lower resolution were attributed to defining the blood pool and true endocardial border.[7)] The advantage of this study was that all three exams were performed the same day, while the weak point was the small population.

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When clinicians interpret LV volume and LVEF findings, awareness of inter-imaging variation will be useful for patient follow-up. An understanding of clinical studies and meta-analyses is also helpful, because LV volume and EF are frequently adopted as outcome measurements in clinical research. Working groups developing guidelines or expert opinions should also consider measurement methods when LV volume and EF are used as cut-off values for treatment.

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