J Cardiovasc Imaging. 2022 Oct;30(4):320-321
https://doi.org/10.4250/jcvi.2022.0095
pISSN 2586-7210·eISSN 2586-7296

Journal of Cardiovascular Imaging JCVI

Editorial

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Correlation Between Electrical and Mechanical Dyssynchrony in Patients With Heart Failure With Reduced Ejection Fraction

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▸ See the article "Evaluation of Cardiac Mechanical Dyssynchrony in Heart Failure Patients Using Current Echo-Doppler Modalities" in volume 30 on page 307.

Received: Aug 16, 2022
Accepted: Aug 16, 2022
Published online: Sep 7, 2022

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Conflict of Interest
The author has no financial conflicts of interest.

Mechanical dyssynchrony refers to a delay in the timing of relaxation or contraction of different myocardial segments of the left ventricle (LV) or inter-ventricles (between the LV and right ventricle) (31144228).[1] Mechanical dyssynchrony is prevalent in patients with heart failure (HF), particularly in those with reduced ejection fraction and prolonged QRS complex.[2] The prolonged QRS duration is used as a surrogate of electrical dyssynchrony which occurs due to an asynchronous electrical activation of the LV and is usually the result of a left bundle branch block (LBBB).[3] Moreover, mechanical dyssynchrony does not equal electrical dyssynchrony, and can also occur in its the absence.[4] However, correlation between electrical and mechanical dyssynchrony has been previously reported, and current guidelines for cardiac resynchronization therapy (CRT) suggest indications that are based primarily on electrocardiographic criteria, such as QRS duration and QRS morphology.[5] Nevertheless, measuring mechanical dyssynchrony is important because it is an early marker of myocardial damage, a clinical risk factor of poor outcome, and a predictor of CRT response. Additionally, it can be measured using a variety of imaging modalities.[6-8]

In this issue of the *Journal of Cardiovascular Imaging*, Rehab et al.[9] comprehensively evaluated mechanical dyssynchrony parameters, according to electrical dyssynchrony, using echo-Doppler modality in patients with heart failure with reduced ejection fraction (HFrEF). They compared various Echo-Doppler parameters that indicated mechanical dyssynchrony by classifying the patients into three groups, based on the QRS width on the 12-lead electrocardiogram (ECG) for patients with HFrEF. Patients who exhibited QRS width greater than 150 ms on the ECG, significant differences in the echocardiographic parameters suggestive of LV mechanical dyssynchrony (LVMD) were observed when compared with other groups. Additionally, on measuring the QRS duration using echocardiographic imaging modalities, including tissue-Doppler imaging (TDI) and 2D speckle-tracking echocardiography (STE), patients with intermediate QRS duration (120–150 ms) showed more significant LVMD, than patients with QRS duration < 120 ms. Hence, the QRS duration was significantly correlated with echocardiographic parameters of LVMD and interventricular dyssynchrony. In addition, a LVMD score of ≥ 4 was found as a useful parameter that can distinguish mechanical dyssynchrony with 90% sensitivity and 100% specificity.

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Although this study has the limitation of being a single-center observational study, it has the advantage of reliable study data because the inter-observer reproducibility was evaluated by the inter-class and intra-class correlation coefficients, and both showed excellent agreement. Patients with HF, with a wide QRS duration and LBBB morphology, may have various ventricular activation patterns. In this respect, the authors demonstrated an indicator for sensitive evaluation of this heterogeneity in mechanical dyssynchrony based on the electrical dyssynchrony grade. Hence, considering the current guidelines for CRT, which are based on electrocardiographic criteria including QRS duration and QRS morphology, mechanical dyssynchrony measured using echocardiographic imaging modalities, including TDI and STE, may be considered an indicator, with evident additive value and clinical significance, as suggested by this study.

Therefore, this is a timely topic that reports a comprehensive analysis of the clinical applications of measuring mechanical and electrical dyssynchrony in patients with HFrEF. Future studies based on this study are needed to validate the fundamental associations and differences between mechanical and electrical dyssynchrony, and their various effects on the clinical outcomes and prognosis in patients with HFrEF.

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