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EDITORIAL COMMENT

# Myocardial Strain for Predicting Risk of Sudden Cardiac Death in Hypertrophic Cardiomyopathy*

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Hypertrophic cardiomyopathy (HCM) is the most common hereditary cardiomyopathy characterized by left ventricular hypertrophy in the absence of excess loading conditions.[1,2] HCM carries a significant risk of sudden cardiac death mostly caused by malignant ventricular tachycardias, and is regarded as the most common cause of sudden death in young people.[3] The landmark study by Maron et al[4] demonstrated that implantable cardioverter-defibrillators (ICDs) effectively prevented sudden death in HCM patients with high risk for sudden death. This study changed the paradigm of sudden death prevention in HCM. In the pre-ICD era, medications with β-blockers, calcium-channel blockers, and antiarrhythmic drugs such as amiodarone were used for high-risk patients even though there was no solid evidence to support this clinical practice. ICD therapy significantly reduced HCM-related mortality from 6% to 0.5% per year in tertiary HCM centers.[4-6] On the other hand, device-related complications, such as inappropriate shocks, thrombosis of venous system, and the long-term inconvenience of maintaining the implanted devices should be considered and balanced with the benefit of ICD therapy.[7,8] Therefore, accurate selection of patients for ICD therapy is a critical part in the clinical care of patients with HCM. The American College of Cardiology (ACC)/American Heart Association (AHA) risk factor model[9] and the risk score model proposed by the European Society of Cardiology (ESC)[10] are the 2 most commonly used tools for risk stratification. The 2020 ACC/AHA model added left ventricular (LV) systolic dysfunction, LV apical aneurysm, and extensive late gadolinium enhancement as risk markers. These 3 factors were not used in the ESC risk score model. A study showed that the ACC/AHA risk factor model was more sensitive than ESC risk score model for identifying high SCD risk patients.[6,11]

In this issue of *JACC: Asia*, Lee et al[12] report a retrospective study of 1,416 patients with HCM with a median follow-up of 5.5 years. The primary SCD events, defined as a composite of SCD, aborted SCD, or appropriate ICD shock, occurred in 3.0% of patients. The risk of the primary endpoint was higher in HCM patients with presence of ACC/AHA risk factors and higher ESC risk score. In the current study, both mechanic function of the left ventricle and atrium measured with LV global longitudinal strain (GLS) and left atrial reservoir strain (LARS) were independently associated with SCD events. Adding LV-GLS and LARS to the guidelines had incremental predictive value. For patients with only a single risk factor, adding LV-GLS and LARS could discriminate patients at the highest risk for (7.2% per 5 years) SCD events. LV systolic dysfunction defined as LV ejection fraction <50% is the only function parameter in both ACC/AHA and ESC risk stratifications. The authors' previous work revealed that low-normal LV ejection fraction was an independent predictor of heart hospitalization and cardiovascular death in patients with HCM.[13] The findings in the current study are a step forward toward adding myocardial strain measured with LV-GLS and LARS as a risk factor of SCD. Myocardial strain was a more sensitive marker of myocardial dysfunction in HCM[14] and was reported to have potential to predict the outcome of HCM.[15] However, among patients with SCD events, about 30% had no ACC/AHA risk factor and 65% were

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categorized as low SCD risk by the ESC risk score in the current study. This finding suggested that a significant portion of HCM patients would be exposed to the possibility of sudden death without ICDs according to the current guidelines in the current cohort. This finding is quite different from the report of a Western country.[6] However, there were differences in age and sex in these 2 studies, and a potential ethnic influence might be considered.[16] So, current findings need to be validated in an external cohort of different ethnic groups. Adding myocardial strain improved the prediction power of SCD in patients with only 1 single risk factor, but how to improve the sensitivity of risk stratification using LV-GLS and LARS needs more investigation.

Underestimation of SCD risk can lead to unexpected life-threatening events; however, overestimation of SCD may result in unnecessary ICD implantation with the potential for complications. How to balance the sensitivity and specificity of SCD risk stratification is still challenging. More efforts are needed to recalibrate existing models and find new risk predictors in HCM.

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**KEY WORDS** echocardiography, hypertrophic cardiomyopathy, myocardial deformation, risk factors, sudden cardiac death