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EDITORIAL COMMENT

Left ventricular mass assessment by CMR; how to define the optimal index

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Cardiac magnetic resonance imaging (CMR) is an accurate and reliable means of evaluating cardiac morphology, and therefore very well suited for identifying and characterizing patients with various manifestations of left ventricular hypertrophy (LVH) [1, 2]. For instance, CMR can resolve the question whether training-induced LVH in athletes is a physiological rather than a pathophysiological phenomenon [3–5]. A meta-analysis, involving 59 studies and 1451 athletes (both endurance-trained and strength-trained athletes), showed that the athlete's heart demonstrated normal systolic and diastolic cardiac function, implying that training-induced LVH in athletes is predominantly a physiological phenomenon [6–10]. However, in pathophysiological LVH, such as in patients with hypertension and hypertrophic cardiomyopathy, the presence of LVH portends a poor prognosis whereby there is a negative relation between prognosis and the stage of LVH [11–21]. On the other side of the spectrum, a significant decrease in LV mass, such as in patients following myocardial infarction, may also be associated with a poor prognosis as these patients are prone to the development of heart failure [22–39].

Within the latest 10 years, research in LVH as cardiac target organ damage has uncovered its prognostic importance. Several studies have indicated that adequate pharmacological treatment, such as beta-blocking agents, ACE-inhibition, and angiotensin II receptor blockade, is very effective in reducing LVH [40–47]. In addition, reduction of LV mass is associated with substantial and significant reduction of cardiovascular morbidity and mortality [46]. Hypertension is strongly associated with increased risk of subsequent heart failure, and meta-analysis data have suggested that reduction in blood pressure and LV mass is associated with very substantial reductions in incident heart failure [47, 48]. Consequently, LV mass should be accurately calculated as mass size may have important clinical implications [49–53].

Generally, LV mass divided by body surface area (BSA) has been used clinically to account for body size, but its validity is not fully clear. Methods to index LV mass for body size have not been investigated using CMR. In the current issue of the *International Journal of Cardiovascular Imaging*, Brumback et al. [54] sought for new accurate indices of LV mass. The main purpose of the study was to develop allometric indices for LV mass measured by CMR and to compare estimates of the prevalence and predictive value of LVH defined new allometric indices. Two indices were derived from linear

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regression models fit to CMR data from the reference sample of the Multi-Ethnic Study of Atherosclerosis (MESA) participants. The indices are called allometric as they are proportional to LV mass divided by a body size variable raised to a scalar exponent. The authors evaluated 5,004 participants from the MESA trial with CMR measurements of LV mass without signs of clinical cardiovascular disease at baseline who were followed for a median of 4.1 years. The new indices and limits for hypertrophy (95th percentile) were finally derived from 822 normal-weight, normotensive, non-diabetic subjects. There were 107 events consisting of coronary heart disease or stroke. The estimated prevalence of LVH at baseline and hazard ratio for events associated with LVH were 8% and 2.4 with the new allometric height-weight index, 11% and 2.2 with LV mass/BSA, 23–24% and 2.0–2.1 with height indices, and 20% and 1.7 with un-indexed LV mass. A statistically significant difference was detected between the hazard ratios based on the new height-weight index and un-indexed LV mass. It was concluded that the prevalence of hypertrophy is higher for indices that do not account for weight. The predictive value of hypertrophy was significantly better with the new allometric height-weight index than with un-indexed LV mass and may be better than indices without weight.

The current study is clinically important since an evaluation of the most suitable indices for LV mass has not previously been performed using CMR. An indexed LV mass should be more predictive of a cardiovascular event than un-indexed LV mass. Therefore, the authors should be complimented for developing new allometric indices for CMR-derived LV mass with potential major implications in clinical practice.

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