

Meeting abstract

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2027 Accuracy and reproducibility of quantifying myocardial fibrosis in hypertrophic cardiomyopathy using delayed enhancement cardiovascular magnetic resonance thresholding techniques

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Background

Cardiovascular magnetic resonance (CMR) with delayed enhancement (DE) has become the gold standard for the identification and quantification of myocardial fibrosis in coronary artery disease. In this regard, DE thresholding to 2 standard deviations above normal myocardium is now considered the most robust method for quantifying fibrosis with high accuracy and reproducibility. However, whether this method is the most appropriate for non-ischemic cardiomyopathies such as hypertrophic cardiomyopathy remains uncertain. Our goal was to compare the performance of various thresholding techniques to a visual assessment in a large cohort of patients with hypertrophic cardiomyopathy (HCM).

Methods

DE-CMR imaging was performed 15 minutes after the intravenous administration of 0.2 mmol/kg of gadolinium-DTPA (Magnevist, Schering; Berlin, Germany) with a breath-hold segmented inversion-recovery sequence (TI = 240–300 ms), in 203 HCM patients (42 ± 17 years; 71% male) from two HCM referral centers. Two blinded, independent readers first quantified fibrosis by visual assessment then using thresholds of 2 standard deviations (SD), 3 SD, 4 SD, 6 SD above the mean of normal, remote myocardium, and 2 SD above noise (2 SDN). The quantification was repeated ≥ 4 weeks apart for reproducibility.

Results

DE was present in 51% of subjects, with an interobserver agreement of 93%. For the detection of fibrosis, 6 SD correlated best with visual assessment as compared to 2, 3, 4 SD, or 2 SDN. Average visual quantity of fibrosis was 13 ± 20 g compared with 12 ± 17 g at 6 SD, and 55 ± 31 g at 2 SD, 36 ± 27 g at 3 SD, 25 ± 23 g at 4 SD, and 64 ± 69 g at 2 SDN. All thresholds were significantly correlated with visual assessment, with 6 SD having the most robust correlation ($r = 0.913$, $p < 0.0001$) vs. 2 SD, 3 SD, 4 SD, and 2 SDN ($r = 0.806, 0.874, 0.905, 0.533$, respectively; all $p < 0.001$). Compared with visual assessment, 6 SD had the lowest intraobserver variability (0.6 ± 8 g, $\kappa = 0.66$; $p < 0.0001$ vs. 1.4 ± 9 g, $\kappa = 0.49$; $p < 0.0001$) and interobserver variability (5.4 ± 18 g, $\kappa = 0.20$; $p < 0.0001$ vs. -18.4 ± 18 g, $\kappa = 0.08$; $p < 0.0001$).

Conclusion

CMR DE thresholding techniques utilizing 6 SD above the mean of visually normal, remote myocardium appears to be both an accurate and reproducible method for the quantification of myocardial fibrosis in HCM. This methodology should be considered for serial assessment of myocardial fibrosis in longitudinal HCM studies.