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Letter: "Prognostic Value of Late Gadolinium Enhancement Cardiovascular Magnetic Resonance in Cardiac Amyloidosis"

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We read with great interest the study by Fontana, et al (1) in a large cohort of subjects with cardiac amyloidosis demonstrating the association of late gadolinium enhancement (LGE) on MRI with increasing amyloid infiltration of the myocardium, as measured by extracellular volume, and the incremental prognostic value associated with transmural LGE on survival. LGE is pathologically associated with amyloid infiltration of the myocardium and concomitant fibrosis, and thus indicative of pathological hypertrophy, and has now been shown to have prognostic significance in amyloid. Accordingly, we hypothesize that a novel measure of myocardial shortening, the myocardial contraction fraction (MCF) would also be associated with delayed enhancement and be a powerful, yet simple predictor of outcomes in patients with cardiac amyloid. We previously described the MCF, defined as the ratio of LV stroke volume to myocardial volume, and demonstrated that the MCF could successfully distinguish patients with heart failure with preserved ejection fraction from athletes with physiologic hypertrophy and normal controls when measured with three-dimensional echocardiography. (2) The MCF provided a measure of ventricular function independent of chamber size that represents a volumetric measure of abnormal myocardial shortening, which was able to distinguish physiologic from pathologic hypertrophy. Measures of LV chamber performance are based on the premise that the myocardium is nearly incompressible and does not change volume significantly from end-diastole to end-systole. Capitalizing on this fundamental principle of myocardial incompressibility by indexing the stroke volume to the myocardial volume, the MCF is an index of the volumetric shortening of the myocardium. During systole, the myocardium shortens and thickens, reducing its contained volume by the stroke volume. The MCF, though operationalized prior to the advent and widespread measurement of strain using echocardiography, is highly correlated with global longitudinal strain. (3) MCF is analogous to ejection fraction (EF) in that it is a ratiometric measure that is easily obtainable and unitless and therefore does not need to be indexed to body size, age or gender. We have shown in a small cohort with cardiac amyloid in whom the average EF was preserved ($51.2\% \pm 13.1$) the MCF was significantly decreased ($29.9\% \pm 15.8$) and was an independent predictor of survival. (4) Accordingly, given the association reported by Fontana, et al between increasing LGE, increasing LV mass, reduced longitudinal shortening and stroke volume, as well as the independent prognostic value for survival of LGE and stroke volume but not EF, we wonder how the MCF would perform in

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predicting adverse outcomes in the population studied. We look forward to seeing these additional analyses and developing simple, widely available metrics to improve the care of patients with cardiac amyloidosis.

Citations

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