Distribution and significance of myocardial hyperintensity on T2-weighted MRI of hypertrophic cardiomyopathy

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Target Audience: physicians who are interested in myocardial tissue characterization

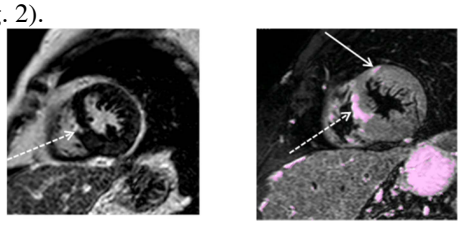
Introduction: Late gadolinium enhancement (LGE) MRI identifies myocardial scarring related to adverse cardiac events associated with hypertrophic cardiomyopathy (HCM). T2-weighted imaging is another MRI sequence visualizing myocardial edema that is different from LGE.[1,2] However, no previous studies have described the HCM phenotypes studied and not analyzed T2-weighted imaging separately from LGE. The purpose of this study was to evaluate the distribution and significance of myocardial hyperintensity on T2-weighted imaging (T2-HI) in patients with asymmetrical septal HCM (ASH), the most common phenotype of HCM.

Methods: 36 ASH patients were enrolled. Black-blood T2-weighted imaging was acquired in all patients on a 1.5 T or 3.0 T, and T2 mapping was acquired using multiple-echo spin-echo imaging in 5 patients and 5 healthy volunteers using a 1.5T. T2-HI and LGE were defined as the region with the mean signal intensity 3SD or 6SD higher than that of the remote myocardium, respectively. Two independent readers assessed T2-weighted and LGE images separately, and thereafter; 1) The distribution of T2-HI was compared with that of LGE based on AHA 16-segment model; 2) The relationships between the T2-HI or LGE and the risk markers of HCM, including presence of unexpected syncope, nonsustained ventricular tachycardia (NSVT) and elevated troponin T levels, were evaluated; and 3) T2 values of T2-HI were compared with those of the remote myocardium of ASH and of the normal myocardium of the volunteers.

Results: T2HI was observed in 18 segments (3.1%) in 13 ASH patients (36.1%). 1) 12 of the 18 T2-HI were localized within and 6 were outside the LGE (Fig. 1). The concordance of T2-HI and LGE was moderate when analyzed on the per-patient basis (k = 0.47) and mild when analyzed on the per-segment basis (k = 0.30). 2) The presence of T2-HI was significantly related to syncope (P = 0.016), but not to NSVT and elevation of troponin T in ASH. LGE was not related to any risk markers, but the absence of LGE indicated the absence of NSVT. 3) The T2 values were significantly greater in 6 T2-HI of the 5 patients (mean, 60.0 ms) compared with the remote myocardium of ASH (mean, 47.7 ms; P = 0.006) and with the normal myocardium of the volunteers (mean, 47.4 ms; P = 0.027; Fig. 2).

Discussion: In this study, one third of T2-HI localized outside myocardial LGE, contrary to the previous reports. [1,2] One possible reason for this discrepancy is that we interpreted the T2-weighted and LGE MRI separately. Another possible reason is the difference in the HCM phenotypes between studies. The syncope associated with HCM may be caused by various mechanisms, and T2-weighted MRI may be useful for identifying myocardial damage related to syncope in ASH. The current T2 value measurement indicates the T2-HI includes more water contents or tissues with prolonged T2.

Conclusion: T2-HI (myocardial hyperintensity on T2-weighted images) reflects myocardial edema, which is related to syncope associated with ASH. Because T2-HI is often localized outside the LGE area, T2-weighted MRI should be interpreted carefully in patients with ASH.



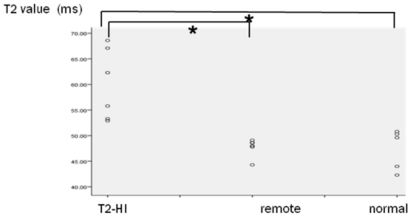


Fig 1 T2-HI at the septum corresponds to LGE (dotted arrow), but not the T2-HI at the anterior region (arrow).

Fig 2 T2 values of T2-HI are beyond those of the remote myocardium and normal myocardium (* P < 0.05).

References: 1. Hueper K. In hypertrophic cardiomyopathy reduction of relative resting myocardial blood flow is related to late enhancement, T2 signal, and LV wall thickness. PLoS One 2012; 7: e41974; 2. Abdel-Aty H. Abnormalities in T2-weighted cardiovascular magnetic resonance images of hypertrophic cardiomyopathy: regional differences and relation to late gadolinium enhancement and severity of hypertrophy. JMRI 2008; 28: 242