Use of a Cine-IR (multi TI inversion recovery) sequence in diagnosis of cardiac amyloid: comparison with echocardiography

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Introduction: Cardiac involvement is frequent in systemic amyloidosis and is a major determinant of treatment options and prognosis. Noninvasive diagnosis of cardiac amyloidosis is challenging: while echocardiography is considered the noninvasive test of choice for diagnosis, it does have significant limitations. Classic MRI findings in cardiac amyloid include diffuse patchy delayed enhancement and difficulty nulling the myocardium. We sought to better define these observations by investigating myocardial signal characteristics after gadolinium contrast administration using a cine multi-TI inversion recovery sequence (cine IR).

Methods: 30 patients with known systemic amyloidosis were evaluated with echocardiography and MRI. All patients also had echocardiography performed within 1 week of MRI. Patients with echocardiography examinations that were positive or negative for cardiac amyloid were included; those with indeterminate findings on echocardiography were excluded. The ecg-gated cine IR sequence was performed in a mid ventricular short axis location 5 and 9 minutes after administration of 0.2 mM/kg gadolinium contrast agent, with the following parameters: 8mm slice thickness, 224x160 matrix, TR/TE 5.9/2.8 ms, flip angle 12°, bandwidth 32 kHz, 0.5 excitations, 40 cm field of view. Regions of interest were placed in the ventricular septum and left ventricular blood pool and plots of signal intensity vs TI were generated. These were correlated with the results of echocardiography.

Results: 15/30 patients had cardiac amyloid by echocardiography. 14/15 patients with positive echocardiography had cine IR curves in which the myocardial inflection point occurred at a shorter TI than the blood pool inflection point. 14/15 patients with negative echocardiography had cine IR curves in which the myocardial inflection point occurred at a longer TI relative to the blood pool (Fig. 1). In two patients the curves essentially overlapped and were considered indeterminate.

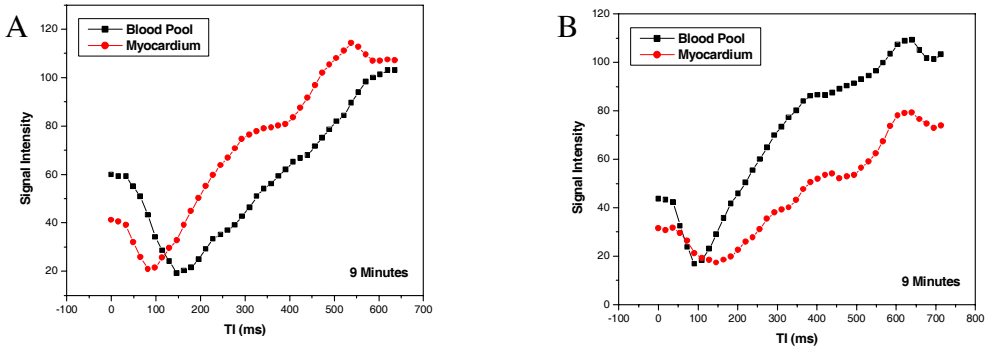

Fig. 1. Cine IR curves from patients with (A) and without (B) echocardiographic evidence of cardiac amyloid. Note that the myocardial inflection point occurs at a shorter TI than the blood pool in the positive case, and at a longer TI than the blood pool in the negative case.

Conclusions: The cine IR sequence allows rapid assessment of normal and abnormal myocardial nulling with respect to the blood pool. Simple visual assessment of the signal intensity vs TI curves and classification based on the position of the myocardial inflection point relative to the blood pool showed excellent agreement with echocardiography and may serve as a rapid, clinically useful evaluation for abnormal myocardial nulling in cardiac amyloid.