

Case Report: Hypertrophic Cardiomyopathy in a Pediatric Patient; Usefulness of T1 Mapping Synthetic Inversion Recovery Imaging

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Patient history

A 13-year-old patient with a family history of hypertrophic cardiomyopathy (HCM) underwent cardiac magnetic resonance (CMR) imaging in our MAGNETOM Aera 1.5T (Siemens Healthcare, Erlangen, Germany). The CMR examination focused on the evaluation of left ventricle outflow tract, biventricular architecture, myocardial thickness, systolic biventricular function, atrial dimensions and tissue characterization.

Sequence details

Steady state free precession cine images were acquired in long axis (4-, 2- and 3-chambers) and short axis, in order to measure atrial dimensions, maximum myocardial thickness in end diastolic phase and to evaluate presence of systolic anterior movement of the mitral valve

and ventricular architecture. Systolic biventricular function was calculated using short axis cine images analysed on an off-line workstation.

Native T1 mapping (MOLLI 5(3)3) was acquired in long axis and short axis planes.

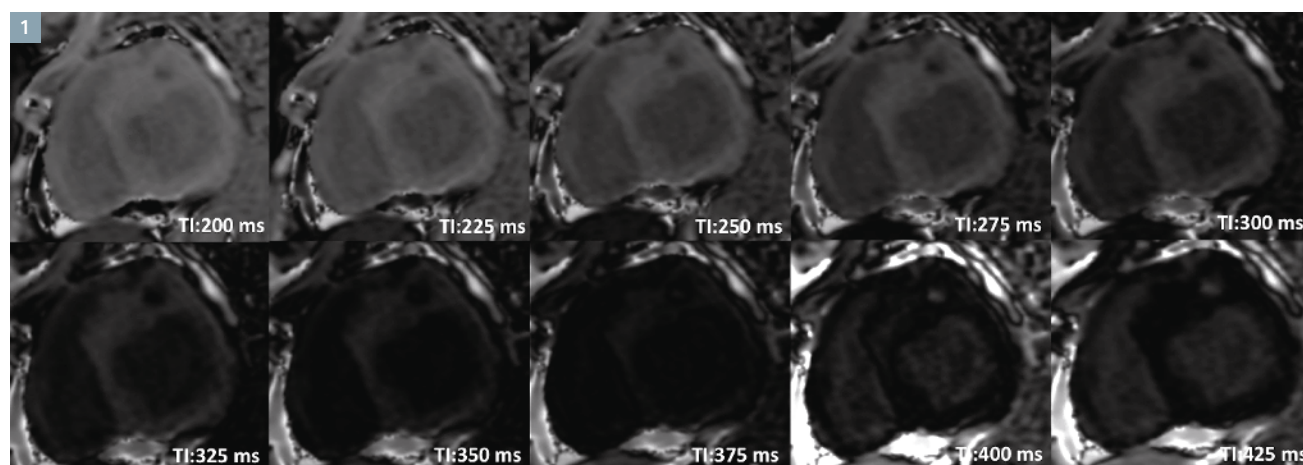
10-15 minutes after administration of gadolinium-based contrast agent (0.2 mmol/kg), the presence of late gadolinium enhancement (LGE) areas were assessed acquiring, on long axis and short axis, conventional 2D segmented magnitude inversion recovery and phase sensitive inversion recovery; followed by the acquisition of post T1 mapping (MOLLI 4(1)3(1)2) in the same cardiac planes of conventional LGE.

The extent of LGE was evaluated both on conventional and T1 mapping-derived (synthetic LGE)¹ sequences (Fig. 1).

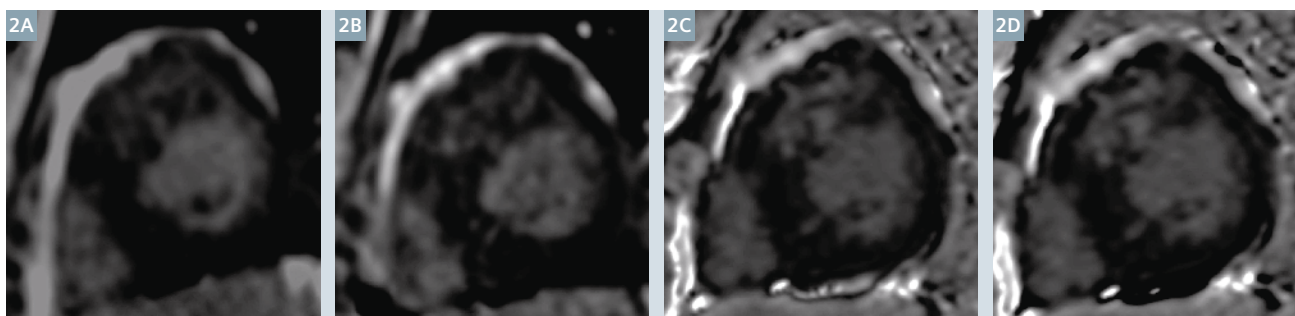
The patient showed asymmetric HCM involving the basal antero-septum (23 mm of maximum wall thickness, Z score = 5 standard deviation), with associated mild dilatation of left atrium and absence of systolic anterior movement of the mitral valve. Biventricular systolic function was preserved.

A wide area of late enhancement (18% calculated using five standard deviation as cut-off compared to normal myocardium) was observed in hypertrophic segments of both conventional and synthetic LGE sequences (Fig. 2).

¹ Synthetic PSIR reconstruction from the T1 Mapping data is WIP. The product is currently under development and is not for sale in the US and in other countries. Its future availability cannot be ensured.



1 Synthetic LGE magnitude reconstructed, derived from post T1-mapping acquisition. Images are reconstructed with an inversion time included between 200 and 425 ms with an increment of 25 ms.



2 Images (2A+B) show conventional LGE acquired in short axis, reconstructed with magnitude inversion recovery (2A) and phase sensitive inversion recovery (2B). LGE images (2D+D) are derived from T1 mapping. Synthetic magnitude LGE is shown in (2C) while synthetic phase sensitive LGE is in (2D). The extent of LGE is similar for both conventional and synthetic LGE.

Comments

Nowadays CMR is crucial in the diagnosis and risk stratification of patients with HCM [1]. Indeed CMR in HCM allows the assessment of diffuse and focal fibrosis; the latter associated with a poor outcome [2].

The depiction of focal fibrosis in CMR is commonly available acquiring conventional LGE sequences 10-15 minutes after the injection of contrast agent. However, the acquisition of LGE sequences in children² can sometimes be challenging, particularly due to fast heart rate and small size of ventricle [3]. In our institution, the CMR protocol for cardiomyopathies includes the acquisition of T1 mapping, before and after contrast,

in order to calculate the extracellular volume and to evaluate synthetic LGE derived from T1 mapping inversion recovery imaging. Indeed, Varga-Szemes et al. showed that the amount of LGE calculated with synthetic LGE is similar to that acquired with conventional sequences in patients with myocardial infarction [4].

Therefore, the possibility to acquire synthetic LGE, despite the lower spatial resolution compared to conventional segmented LGE sequences, can be useful in pediatric cases where the standard LGE approach might show presence of artefacts, and the evidence of LGE is pivotal in clinical management.

² MR scanning has not been established as safe for imaging fetuses and infants under two years of age. The responsible physician must evaluate the benefit of the MRI examination in comparison to other imaging procedures.

References

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