Myocardial T2-Mapping and T2-value Measurement using Breath-hold Gradient- and Spin-echo (GRASE) imaging: Comparison with Navigator-gated Spin-echo Imaging

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Introduction: Myocardial T2-mapping and T2-value measurement using cardiac MRI are valuable for assessment of iron-overload on the myocardium and myocardial edema or inflammation. Because of the use of ECG-gating and respiratory compensation, the myocardial T2-mapping and T2-value measurement using spin-echo (SE) imaging is time-consuming. Gradient- and spin-echo (GRASE) imaging has been used to measure T2-value of the knee cartilage. We proposed to perform ECG-gating breath-hold GRASE imaging for the generation of the T2-mapping and the measurement of the T2-values of the myocardium and compared them with those acquired by the SE imaging.

Methods: Nineteen patients with varied myocardial diseases, who had no history of hemosiderosis and iron-overload, were enrolled. A 3.0-T unit and 6-channel multi-coil were used, and navigator-gated SE and breath-hold GRASE were performed to generate the myocardial T2-mapping and to measure the myocardial T2-values. Both SE and GRASE techniques used ECG-gating, black-blood preparation per 1 RR, and 5-multiecho-time acquisition (i.e., 20, 30, 40, 50, and 60 ms). The GRASE was acquired with the 3, 5, or 7-multishot acquisition. The in-plane spatial resolution of the SE and GRASE was 2.97 x 3.30-3.58 mm^2, and the slice thickness was 5mm. Sensitivity encoding was applied to all sequences.

Image homogeneity of the myocardium was evaluated on the myocardial T2-mapping generated from the SE and GRASE visually. The myocardial T2-values of the interventricular septum and left ventricular lateral wall were measured using region-of-interest method (including 14 pixels at least), and the differences and correlations for these values were analyzed between the SE and GRASE imaging.

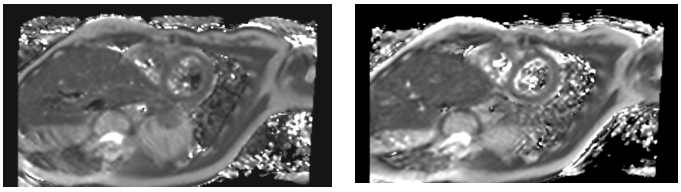
Results: Image homogeneity of the myocardium did not differ between SE and GRASE (Figures). However, the respiratory artifacts were significant in 3 of the 19 patients in the navigator-gated SE images. GRASE required 15-25 sec breath-hold, and no respiratory artifacts were observed. There were no significant differences in the myocardial T2-values between SE and GRASE. There were significant correlations for the T2-values of the septal myocardium between SE and GRASE, and the r-value was highest between SE and GRASE with the multishot acquisition = 3 (r = 0.82: Table). The myocardial T2-values of the left ventricular lateral wall varied largely.

Conclusion: GRASE with the multishot acquisition = 3 provided the T2-mapping with few artifacts and the myocardial T2-values comparable to those acquired by SE imaging during the acceptable breath-holding time.

References: 1. Quaia E. Skeletal Radiol 2008; 37: 511. 2. Guthrie J. JMRI 2009; 30: 684. 3. Smith GC. JCMR 2011; 13: 21.

Table Correlation of myocardial T2-values between SE and GRASE

		GRASE (3)	GRASE (5)	GRASE (7)
r for SE	septal	0.82	0.57	0.70
	lateral	NS	NS	0.52



Figures

T2-mapping generated from SE and GRASE (multishot=3). The image homogeneity of the myocardium is not significant and does not differ between the two images.