

Abstract

Title: Study of T1 and T2 relaxation times of the myocardium in normal subjects and myocardial infarction using multiparametric cardiac MRI

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Objectives:

To study the native T1, T2 and post contrast T1 relaxation times of myocardium in normal subjects and establish a baseline reference value for our institution.

To study the native T1, T2 and post contrast T1 relaxation times of myocardium in myocardial infarction.

Back ground:

Management of ischemic heart disease depends upon viability assessment. If more than 50% of the thickness of the myocardium is infarcted, it is less likely to recover functionality after re-vascularization. Late gadolinium enhanced MRI is one of the methods to assess viability of myocardium.

Methods:

The native T1, post contrast T1 and T2 mapping cardiac MRI was performed on 1.5-T MRI scanner. 31 healthy normal controls and 40 patients with myocardial infarction were included in this study and the native T1, T2 and post contrast T1 values were recorded in all subjects. Based on the final diagnosis on the routine cardiac MRI images including assessment of segmental wall motion and late gadolinium enhancement, all analyzed segments were grouped into 7 categories, which were, normal segments in normal subjects, normal segments in patients with myocardial infarction, hibernating myocardium, segments with < 25%, 25-50%, 50-75% and > 75% infarction. The native T1, T2 and post contrast T1 values were compared across categories to evaluate their role in viability assessment.

Results: We established native T1, post contrast T1 and T2 relaxation times of the myocardium in normal subjects and these can be used as baseline reference values for further studies in our institution.

Mean segmental T1 and T2 values in our study

Mean	0-Healthy Controls (ms)	1-Normal segments in patients (ms)	2-Hibernating (ms)	3-< 25% Subendocardial (ms)	4 < 50% of myocardial (ms)	5 < 75% of transmural (ms)	6 - > 75% transmural (ms)
Native T1	1040.47±74	1077.90 ±75.5	1101.56±74.5	1149.09±97.5	1082±73	1115.78±104	1125±17
T2	51.3±16	53.21±5.6	53.2± 5.1	56±6.3	52.6±5	55.4± 7	58.11±8
Post contrast T1	561.65 ±70	516.05± 89	513.86±86	570.83±72	488.7±65	427.6±114	420.9±113

T1 values were different across the categories, which was statistically significant (p value <0.05). Although there was minor overlap between groups, T1 values showed an increasing trend with increasing degrees of infarction, while, post contrast T1 values showed a decreasing trend.

T2 values were not significantly different across categories. This is probably because all the patients in our study had chronic myocardial infarction.

CONCLUSION

We established the normal native T1, T2 and post contrast T1 values in our institution.

Native T1, T2 and post contrast T1 values were different in the various categories of infarcted segments as compared to normal values and this was statistically significant.

Parametric T1 and T2 mapping of the myocardium can potentially differentiate normal, non-viable and viable myocardium and could be used as an alternative imaging sequence in viability assessment, especially in patients where gadolinium is contraindicated. Threshold native T1 value of 1091 ms, differentiated viable and non-viable myocardium with sensitivity of 51.7% and specificity of 62.2%.

Key words: T1 T2 mapping, Normal, Myocardial infarction