# Evaluation of myocardial T1 times in acute myocardial infarction

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## Introduction:

Contrast-enhanced cardiac MR imaging (ceMRI) is well established for the assessment of myocardial viability and allows discrimination of reversible and irreversible ischemic injury [1]. Image quality and contrast between normal and infarcted myocardium depend on the tissue T1-times and the correct setting of the inversion time (TI). TI has to be adjusted individually and should be set to null the signal intensity of normal myocardium, which improves the contrast between viable and nonviable myocardium [2]. The optimum TI depends on the T1 values of normal and infarcted myocardium. However, the time course of myocardial T1 times after contrast injection has not been investigated in patients with acute myocardial infarction yet. The aim of this study was to measure T1 values of normal and infarcted myocardium af ter contrast injection using IR-SSFP sequences.

## Materials and Methods:

38 patients (30 male, 8 female, mean age 56.0±13.0 years) with first acute ST-elevation myocardial infarction (MI) were enrolled into the study. MR imaging was performed on a 1.5T MR-system within 2.9±1.9 days after MI. T1 values of non-infarcted myocardium and infarcted myocardium were estimated using an inversion recovery steady state free precession sequence (IR-SSFP; TR 2.5ms, TE 1.1ms, FA 50°) with incrementally increased inversion times acquired during a single breath-hold. Long axis views covering the area of the infarction were collected before and 1, 3, 5, 10, 15, 20 and 25 minutes after Gadodiamide injection (0.2 mmol/kg body weight, Omniscan, Amersham). T1 values were obtained using the following equation: $T1 = TI_{(min)}/\ln 2$, where $TI_{(min)}$ is the inversion time of the image with the minimum signal intensity of the tissue. T1 values were calculated for normal myocardium, the area of late enhancement (LE) and the no-reflow zone.

## Results:

The T1 times of normal myocardium and the area of LE showed no significant differences within the first three minutes after contrast injection. Thereafter, the area of LE showed significant shorter T1 values with a maximum difference 15 minutes after contrast administration (LE: 264±38ms; normal myocardium: 354±33ms; Fig 1,3). The maximum difference between the no-reflow zone and the surrounding tissues was found immediately after contrast administration (no-reflow T1=347±167ms, normal myocardium T1=206±41ms, LE T1=211±86ms; Fig 2).

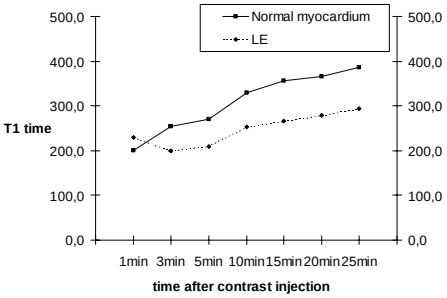


Fig 1: Normal myocardium and LE.

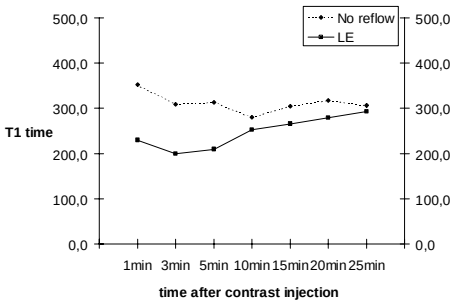


Fig 2: No reflow and LE.

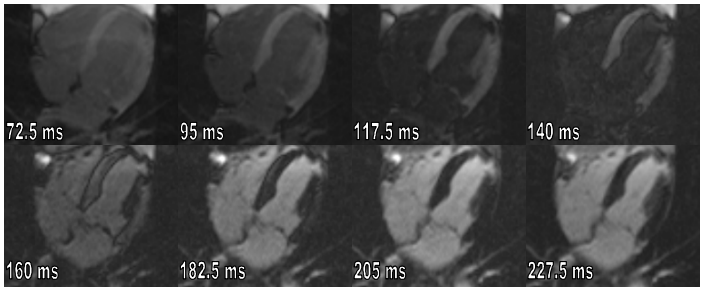


Fig 3: Acute antero-lateral myocardial infarction. LE at different inversion times 5 minutes after contrast.

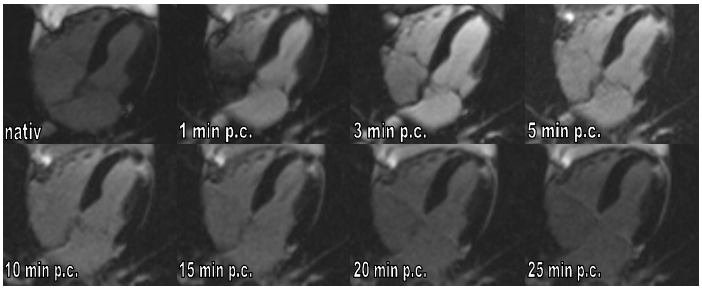


Fig 4: Acute antero-lateral myocardial infarction. LE at different time points following contrast injection.

## Discussion:

Our data show, that the highest contrast between the no-reflow zone and the surrounding tissue can be obtained immediately after contrast administration, whereas the maximium contrast between normal and infarcted myocardium requires a delay of 15 minutes (Fig 3,4). Therefore, in patients with a acute myocardial infarction measurements of the no-reflow zone should be performed immediately after contrast injection, whereas the area of LE should be assessed about 15 minutes after contrast injection.

## References:

[1] Kim RJ et al. Circulation 1999; 100:1992-2002.
[2] Simonetti OP et al. Radiology 2001; 218:215-223.