

# Presence and extent of myocardial oedema is related to overestimation of infarct size following acute myocardial infarction

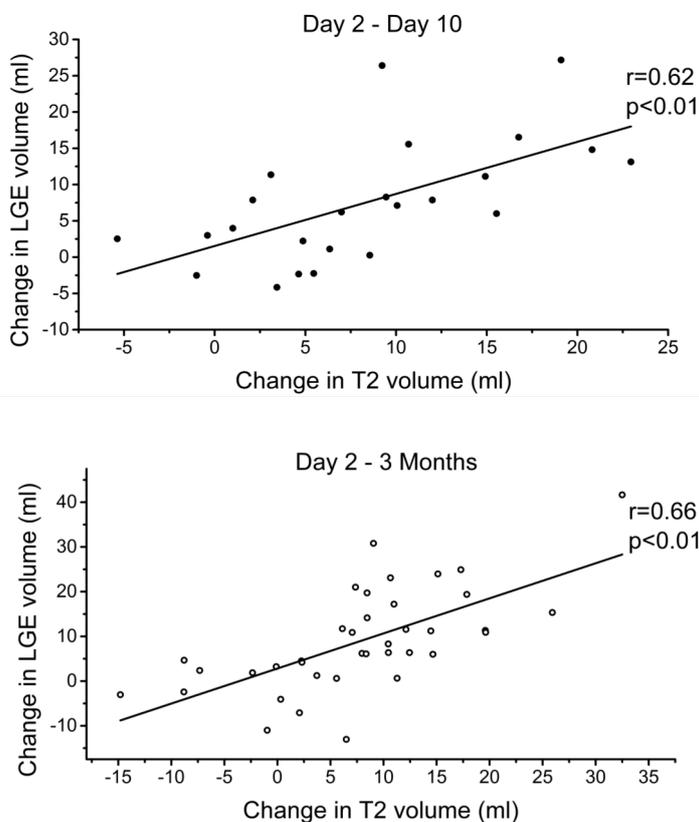
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## Introduction

Late gadolinium enhancement (LGE) is an accurate and reproducible method to delineate nonviable myocardium following myocardial infarction (MI). However, in the early stages following acute MI, LGE has been shown to overestimate the size of the infarct zone by up to 30%. The causes for this are unclear, and may be related to tissue remodelling, intracellular contrast uptake, or expansion of the interstitial space. Myocardial oedema is a feature of reperfused acute MI, and oedematous myocardium has been associated with early contrast enhancement [1]. We hypothesised that the presence of tissue oedema is also related to late enhancement, and contributes to overestimation of infarct size in acute MI.

## Methods

46 patients received CMR examination at 3.0T at 2 days following reperfused ST-elevation acute MI, with follow-up imaging at 10 days and 3 months. Short-axis T2-weighted imaging and cine imaging were performed, as well as LGE imaging 16-20 minutes following administration of 0.1mmol/kg gadolinium DTPA.

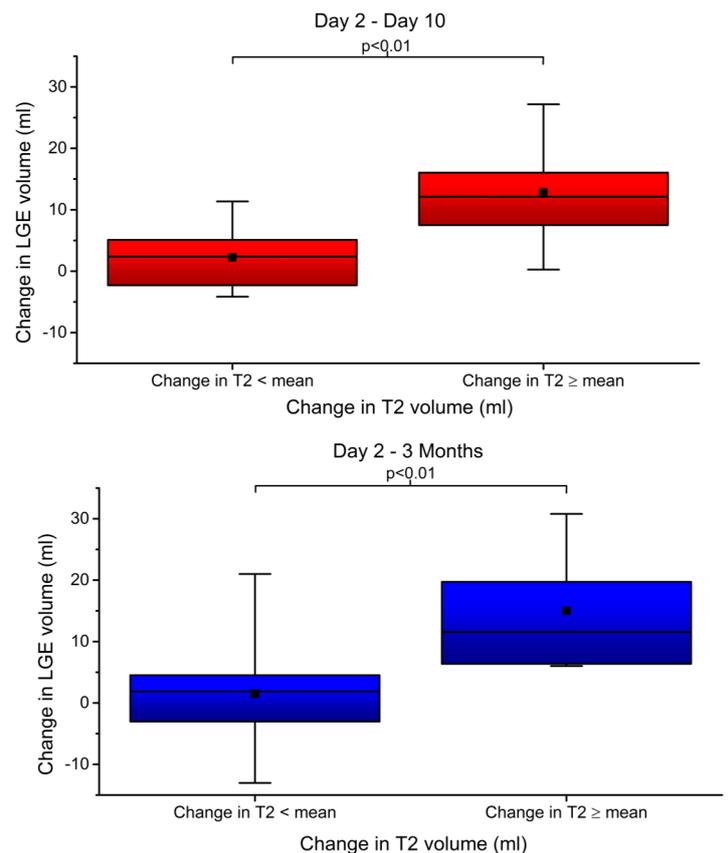


**Figure 1.** Change in estimation of scar volume by LGE correlates with resolution of myocardial oedema by day 10 (top panel) and 3 months (bottom panel).

Oedema volume was measured on T2-weighted imaging and scar volume measured on LGE imaging, both quantified using a semi-automated histogram-based thresholding method (Otsu method). The change in scar volume was compared to the change in oedema volume between day 2 and day 10, and between day 2 and 3 months.

## Results

Of the 46 patients studied, 27 (59%) completed imaging at day 10 and 39 (85%) at 3 months. Mean scar volume decreased by 7ml (23%,  $p<0.01$ ) at 10 days and 9ml (28%,  $p<0.01$ ) at 3 months. There was significant correlation between change in oedema volume and change in scar volume from day 2 to day 10 ( $r=0.62$ ,  $p<0.01$ ) and day 2 to 3 months ( $r=0.66$ ,  $p<0.01$ ) (Figure 1). Stratifying patients into two groups based on mean change in oedema volume, patients with more change in oedema had significantly higher change in scar volume (Figure 2).



**Figure 2.** Acute overestimation of scar volume is related to resolution of myocardial oedema by day 10 (top panel) and 3 months (bottom panel). Box represents interquartile range; whiskers indicate 95% confidence interval of the mean.

## Conclusions

LGE CMR overestimates scar volume acutely following acute reperfused MI. This overestimation correlates with the volume of myocardial oedema detected acutely.