Journal of Cardiovascular Magnetic Resonance

Meeting abstract

113 Microvascular obstruction over time as a predictor for left ventricular remodeling

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from 11th Annual SCMR Scientific Sessions
Los Angeles, CA, USA. 1–3 February 2008

Published: 22 October 2008

Journal of Cardiovascular Magnetic Resonance 2008, **10**(Suppl 1):A14 doi:10.1186/1532-429X-10-S1-A14

This abstract is available from: http://jcmr-online.com/content/10/S1/A14

Introduction

Microvascular obstruction (MO) can be evaluated using contrast-enhanced CMR and is identified as areas of hypoperfusion in the infarct zone within 3 minutes. However, a similar phenomenon can be seen on delayed viability images 10 minutes after contrast injection following acute myocardial infarction (AMI). Due to its shorter scanning time, the inversion-recovery single-shot true fast imaging with steady-state precession (ss-IR) allows analysis of any dynamic changes in infarct and "no-reflow" sizes over time after contrast administration.

Purpose

The aim of this study is to analyze dynamic changes of MO at different times after contrast administration and the size of hypoperfusion that best correlates with ventricular remodeling in patients following AMI.

Methods

Subjects were evaluated using CMR within the first week (n = 60), 3 months (n = 47) and one year (n = 25) after a ST-segment elevation MI percutaneously revascularized. Cine CMR was performed to measure left ventricular function. Additionally, as a gold-standard, segmented inversion-recovery (seg-IR) were acquired 10 min after the administration of contrast, and ss-IR images were acquired sequentially at 1, 3, 5, 7, 10, 15, 20, and 25 min after bolus contrast administration to measure microvascular obstruction. Inversion times were set to properly null normal myocardium at each time point. All images were blinded, randomized, and measured for hypo- and hyper-enhancement volumes.

Results

There was a significant reduction of hypo-enhancement volumes over time ($p < 0.001$). Moreover, there was a 71% reduction in the number of patients with hypoenhanced areas between the 1st and the 25th min (Figure 1). The presence of delayed hypoenhancement at each sequential time point after contrast administration results in larger infarct size, larger end systolic volume (ESV), and reduced ejection fraction (EF). The volume of hyperenhancement at 15 min and the volume of hypoenhancement at 10 and 15 minutes were the best and significant univariate predictors for ESV and EF at 1 year follow-up. In the multivariate analysis, when adjusted for infarct size, the volume of hypoperfusion at 10 min was the only predictor for ESV ($r = 0.7$, $p = 0.001$) and EF ($r = -0.8$, $p < 0.001$) at 1 year follow-up.

Conclusion

Time of imaging after bolus contrast injection is paramount to accurately determine the proper "no-reflow" volume. Infarct size and the volume of microvascular obstruction can predict adverse ventricular remodeling; however, the microvascular obstruction volume 10 min after contrast is the strongest predictor for ESV and EF at one year follow-up.

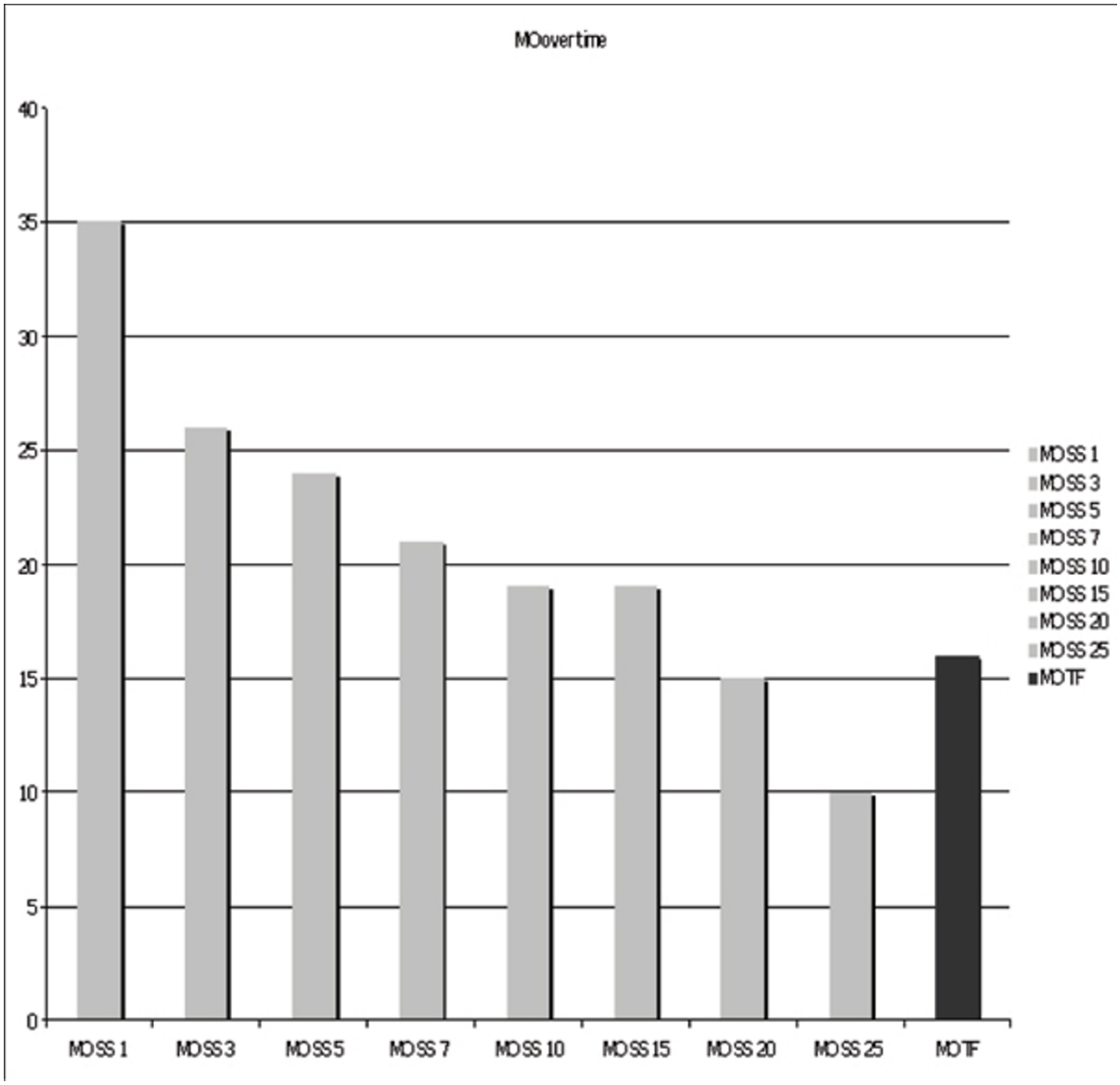

Figure 1
Time after bolus contrast injection is paramount to determine the "no-reflow" volume. The microvascular obstruction volume 10 min after contrast is the strongest predictor for ESV and EF at one year follow-up.