

POSTER PRESENTATION

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Interobserver reproducibility of fully quantitative pixel-wise analysis of clinical CMR perfusion imaging

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From 17th Annual SCMR Scientific Sessions
New Orleans, LA, USA. 16-19 January 2014

Background

Quantitative first pass cardiac magnetic resonance (CMR) perfusion imaging has shown excellent interobserver agreement at a sector level in healthy volunteers and patients. In this study, we compare the myocardial blood flow (MBF) estimates in sector-wise and pixel-wise analysis. We also study the interobserver variability in pixel-wise MBF estimates from patients with coronary artery disease (CAD).

Methods

First pass CMR imaging was performed on 29 patients with known or suspected CAD (15 females, age $54.9 \pm$

14.3 years). Twenty of the patients, defined as the normal group, had minimal or no stenosis ($< 30\%$ by computed tomographic angiogram) and nine patients, defined as the CAD group, had significant CAD ($> 70\%$ stenosis by invasive coronary angiography). All patients were scanned on a 1.5T scanner using a steady state free precession imaging sequence for regadenoson stress perfusion followed by rest perfusion 20 minutes later. Two observers independently traced the myocardial regions of interest in the mid-ventricular slice and quantified the MBF in sector-wise and pixel-wise analyses by a model-constrained deconvolution approach. Pixel-wise MBF estimates were averaged to six transmural sectors to compare with sector-wise

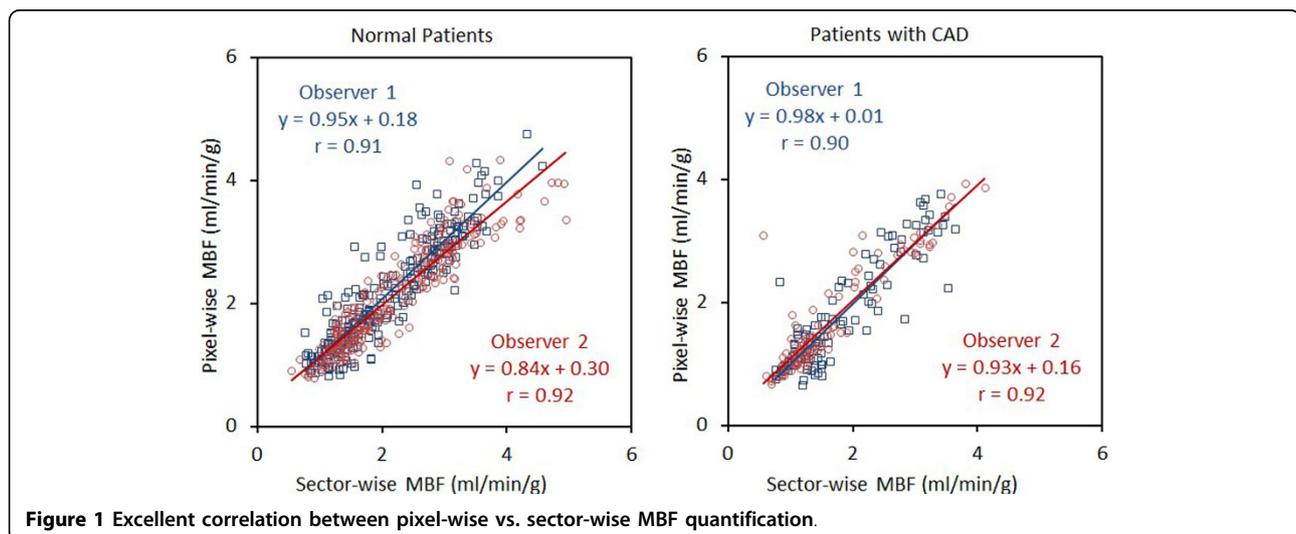
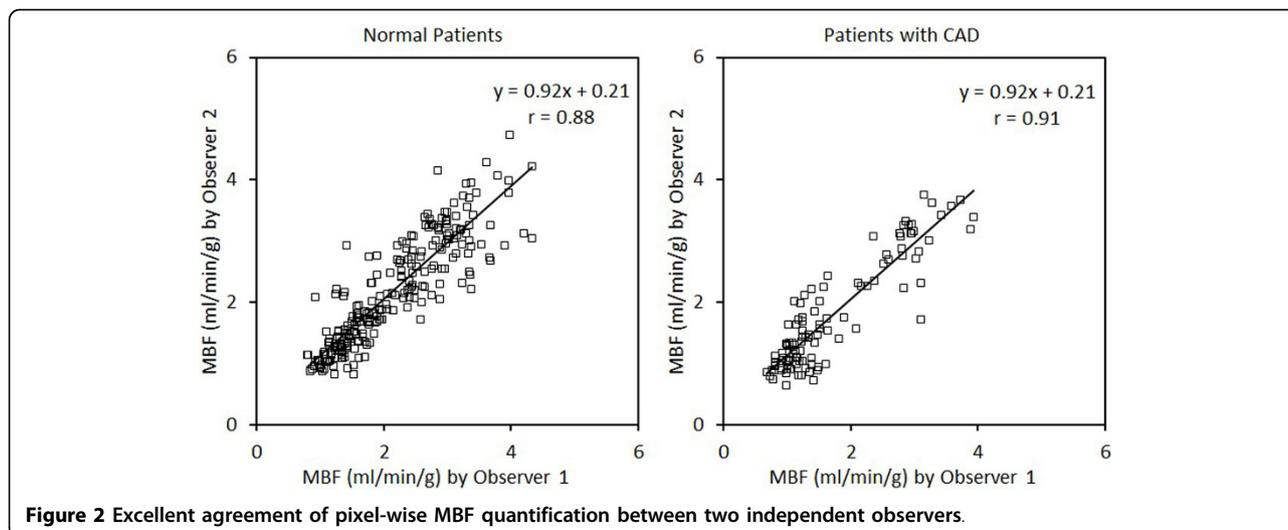


Figure 1 Excellent correlation between pixel-wise vs. sector-wise MBF quantification.

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analysis. Pearson correlation, Bland-Altman analysis, and paired student t-test were used to compare the results.

Results

There was excellent correlation between pixel-wise vs. sector-wise MBF quantification for the 20 normal and nine CAD patients (Figure 1). In both patient groups, Bland-Altman analysis showed no significant bias between the two methods of quantification (mean bias from 0.01 to 0.12 ml/min/g). Limits of agreement were good (2SD range from 0.26 to 0.98 ml/min/g, $p = \text{NS}$ for all comparison). Interobserver agreement of pixel-wise MBF was excellent for both normal and CAD groups (Figure 2). The interobserver agreement was good (2SD range from 0.38 to 0.96 ml/min/g, $p = \text{NS}$ for all comparisons) with no significant interobserver bias (mean bias from 0.02 to 0.15 ml/min/g). The stress MBF in the ischemic zone of patients with $> 70\%$ stenosis was 1.72 ± 0.75 ml/min/g by pixel-wise analysis which was significantly lower than remote MBF (2.85 ± 0.74 ml/min/g, $p < 0.001$).

Conclusions

Clinical first pass CMR perfusion can be quantified at the pixel level and the results agree well with sector-wise comparison. There is an excellent interobserver agreement in pixel-wise quantification of patients with CAD.

Funding

This research was supported by the Intramural Research Program of the National Heart, Lung, and Blood Institute, National Institutes of Health.

Published: 16 January 2014

doi:10.1186/1532-429X-16-S1-P350

Cite this article as: Conn *et al.*: Interobserver reproducibility of fully quantitative pixel-wise analysis of clinical CMR perfusion imaging. *Journal of Cardiovascular Magnetic Resonance* 2014 **16**(Suppl 1):P350.

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