Journal of Cardiovascular Magnetic Resonance

BioMed Central

Oral presentation

Open Access

Detection of haemodynamically significant coronary stenoses with k-t SENSE-accelerated Myocardial Perfusion MR Imaging at 3.0 Tesla - a comparison with fractional flow reserve

Tim Lockie*[1], Divaka Perera[1], Simon Redwood[1], Amedeo Chiribiri[1], Kalpa de Silva[1], Sebastian Kozerke[1], Michael Marber[1], Eike Nagel[1] and Sven Plein[2]

Address: [1]Rayne Institute, St Thomas' Hospital, KCL, London, UK and [2]Rayne Institute, St Thomas' Hospital, KCL and Division of Cardiovascular and Neuronal Remodelling, LIHY Institute, University of Leeds, Leeds, UK

* Corresponding author

from 13th Annual SCMR Scientific Sessions
Phoenix, AZ, USA. 21-24 January 2010

Published: 21 January 2010

Journal of Cardiovascular Magnetic Resonance 2010, **12**(Suppl 1):O3 doi:10.1186/1532-429X-12-S1-O3

This abstract is available from: http://jcmr-online.com/content/12/S1/O3

© 2010 Lockie et al; licensee BioMed Central Ltd.

Background

k-space and time sensitivity encoding (*k-t* SENSE) has been used to improve temporal or spatial resolution of perfusion CMR against visual interpretation of x-ray angiography (XRA).

Purpose

To compare high spatial resolution *k-t* SENSE CMR perfusion at 3 T against fractional flow reserve (FFR), the reference method for detection of flow-limiting coronary stenoses in the catheter laboratory.

Methods

Patients with known or suspected coronary artery disease awaiting coronary XRA were studied, undergoing a CMR scan <48 hrs before XRA.

CMR

k-t SENSE accelerated perfusion CMR was performed on a 3 T Philips Achieva system (saturation recovery gradient echo, repetition time/echo time 3.0 ms/1.0 ms, flip angle 15°, 5× *k-t* SENSE acceleration, 11 interleaved training profiles, effective acceleration 3.8, spatial resolution 1.1 × 1.1 × 10 mm^3, 3 slices acquired at each RR interval). Data were acquired during adenosine hyperaemia and at rest (0.05 mmol/kg Gd-DTPA). FFR was measured in all vessels with >40% severity stenosis using a pressure sensor-tipped wire (Volcano®). FFR < 0.75 was considered to represent a haemodynamically significant lesion. FFR was calculated as $(P_d - P_v)/(P_a - P_v)$, where P_a, P_v and P_d are simultaneous aortic, right atrial and distal coronary pressures measured during an intravenous infusion of adenosine at 140 μg/kg/min. Two experienced observers blinded to the results of the angiogram visually interpreted ischemia on CMR data as relative underperfusion of a sector within a slice or relative endocardial underperfusion compared with epicardial perfusion. The performance of visual analysis of CMR to detect flow-limiting coronary stenosis on angiography was determined. Inter-observer variability was calculated using the *k* coefficient.

Results

39 patients (27 male, age 67.1 ± 8.1 years) were successfully recruited and underwent the complete protocol. 1 patient was excluded from the analysis because of technical problems with the FFR measurement, so that 114 coronary territories were studied. Mean scanning time was 56 ± 13 minutes. 49 vessels underwent pressure wire assessment. Of these, 26 lesions had an FFR < 0.75 (mean 0.53 ± 0.17) and 23 lesions had an FFR ≥ 0.75 (mean 0.89 ± 0.06). Sensitivity and specificity of CMR perfusion to detect coronary stenoses at a threshold of FFR < 0.75 was 0.82 [95% CI 0.61-0.93] and 0.94 [95%CI 0.87-0.98] p < 0.0001, respectively. The *k* variability coefficient was 0.79 Figures 1 and 2.

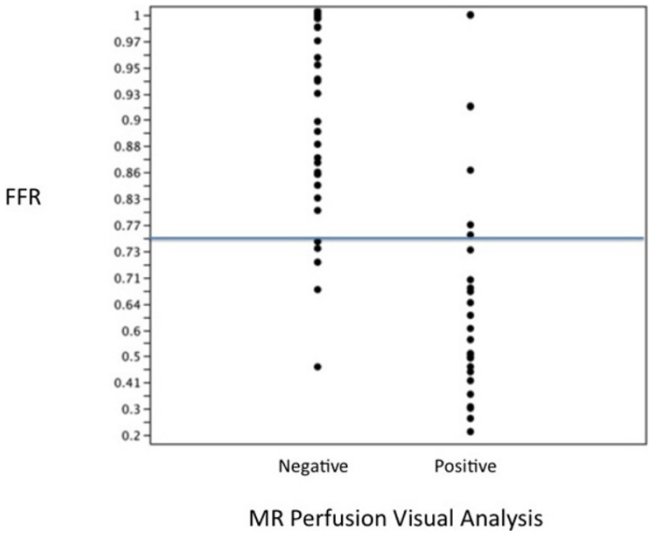

Figure 1

Conclusion

k-t SENSE accelerated high-resolution perfusion MR at 3 T accurately detects flow-limiting coronary artery disease as defined by FFR, with good inter-observer agreement. The high specificity of perfusion CMR in this study may be the result of the high spatial resolution at which endocardial dark rim artefacts are reduced.

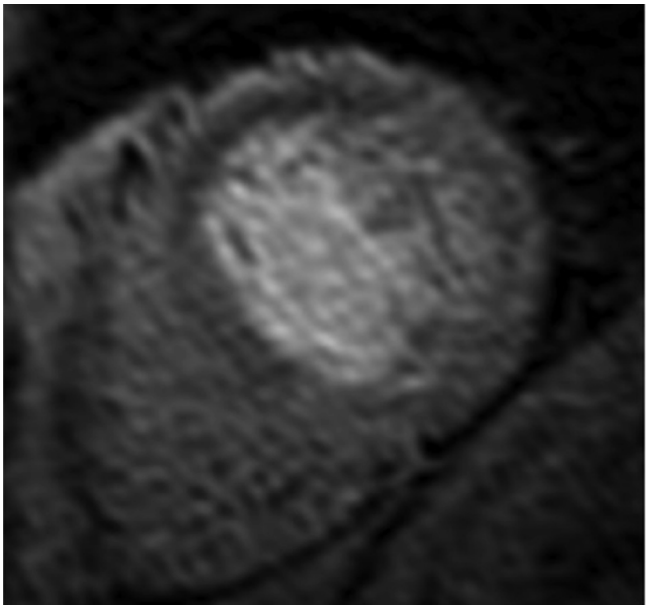

Figure 2
Stress perfusion image showing anterior wall perfusion defect.