High-resolution Versus Standard-resolution Cardiovascular Magnetic Resonance Myocardial Perfusion Imaging for the Detection of Coronary Artery Disease

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Introduction

Although accelerated high-spatial-resolution CMR myocardial perfusion imaging has recently been shown to be clinically feasible, there has not yet been a direct comparison with standard-resolution methods. We hypothesised that higher spatial resolution detects more subendocardial ischemia and leads to greater diagnostic accuracy for the detection of angiographically defined CAD. This study compared the diagnostic accuracy of high-resolution and standard-resolution perfusion-CMR in patients with suspected coronary artery disease (CAD).

Methods

A total of 111 patients with suspected CAD were prospectively recruited. All patients underwent two separate perfusion CMR studies on a 1.5 Tesla CMR scanner, one with standard-resolution (2.5 x 2.5mm in-plane resolution) and one with high-resolution (1.6 x 1.6mm in-plane resolution) acquisition. High-resolution acquisition was facilitated by eight-fold *k-t* broad linear speed up technique (BLAST) acceleration. Two observers visually graded perfusion in each myocardial segment on a 4-point scale. Segmental scores were summed to produce a perfusion score for each patient. All patients underwent invasive coronary angiography. Significant CAD was defined as a coronary artery stenosis of ≥ 50% diameter on quantitative coronary angiography.

Results

CMR data were successfully obtained in 100 patients. A typical example is shown in ***Figure 1***. In patients with CAD (n=70), more segments were determined to have subendocardial ischemia with high-resolution acquisition than with standard-resolution acquisition (279 vs.108; p<0.001). High-resolution acquisition had a greater diagnostic accuracy than standard-resolution acquisition for identifying single-vessel disease (area under the curve [AUC]: 0.88 vs. 0.73; p<0.001) or multi-vessel disease (AUC: 0.98 vs. 0.91; p=0.002) and overall (AUC: 0.93 vs. 0.83; p<0.001) (***Figure 2***)

Conclusions

Our study shows that high-resolution CMR perfusion imaging has greater diagnostic accuracy than standard-resolution acquisition for the detection of CAD in both single and multi-vessel disease patients and detects more subendocardial ischemia.

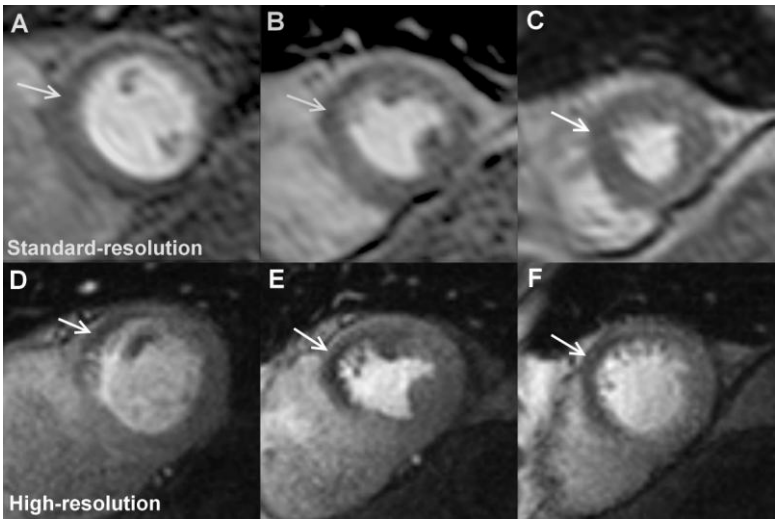

Fig 1. This patient had LAD disease. Standard-resolution stress images show subtle perfusion defects (white arrows) in the basal anteroseptal (A), mid-anteroseptal, mid anterior (B) and apical septal (C) segments. High-resolution shows the same distribution of defects (D-F) but they are better delineated and the transmural extent of ischemia can be assessed.

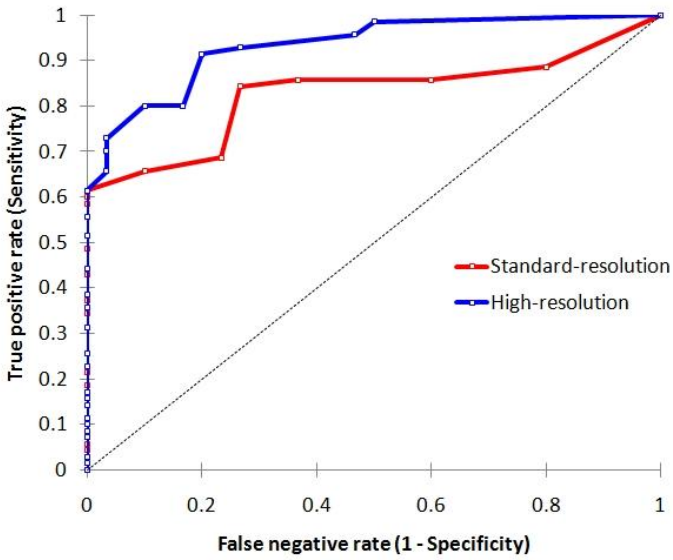

Fig 2. Receiver operator characteristic curves. Standard and high-resolution perfusion CMR both had a high diagnostic accuracy for the detection of CAD but the high-resolution technique was superior. The AUCs were 0.83 for standard-resolution and 0.93 for high-resolution (p<0.001).