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Correlation between an angiographic and a cardiac magnetic resonance score of myocardial jeopardy using standard and high-resolution perfusion sequences

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Objective

Evaluate the correlation between a Cardiac Magnetic Resonance (CMR) and an angiographic myocardial jeopardy score in coronary artery disease (CAD) using either a high-resolution or a standard perfusion sequence.

Background

High temporal resolution required for CMR perfusion imaging results in compromised spatial resolution. However, recent advances, including the use of the advanced acceleration method k-t sensitivity encoding, allow myocardial perfusion imaging with unprecedented spatial resolution. The associated benefits remain to be fully described.

The BCIS-1 Myocardial Jeopardy Score (JS) quantifies the amount of myocardium in jeopardy from severe CAD (0= no jeopardy; 12 = maximum jeopardy). It accommodates patients with CABG and left main disease, is prognostically relevant and can easily be calculated by visual analysis of the X-ray coronary angiogram (XCA). Combined perfusion and scar CMR imaging should provide equivalent functional information on myocardial jeopardy. High-resolution perfusion imaging may improve the correlation between JS and CMR findings.

Methods

40 consecutive study patients with known or suspected CAD underwent 1.5T CMR imaging and standard diagnostic XCA. CMR stress and rest perfusion imaging included 3 transverse slices every heartbeat using a standard TFE (st-TFE) sequence (17 patients) or a high-resolution kt balanced Turbo Field Echo (kt-TFE) sequence (23 patients). Typical acquired spatial resolution: 2.8 x 2.5 x 10mm and 1.7 x 1.9 x 10mm respectively. Cine and scar imaging were also performed.

Data analysis was blind. CMR perfusion and scar data were segmented using the standard 17-segment model excluding the apex. Each segment was subdivided into equal endo and epicardial sub-segments. Sub-segments were assigned as 3% of the total myocardium each and classified as normal, ischaemia or scar. Percentage myocardium affected by ischaemia or scar was then calculated.

Results (tables 1 and 2)

There was a significant correlation between the JS and CMR score which was strongest in the high-resolution kt-TFE group; r=0.78, p=<0.0001 and appeared less strong in the st-TFE group; r=0.63, p=0.007 (figures 1 and 2).

Table 1 st-TFE patient characteristics.

Age (mean ± SD)	64±8 years
Coronary Artery Disease	82%
Male	71%
Hypertension	82%
Diabetes	41%
Previous CABG	0%
Previous PCI	6%

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Table 2 kt-TFE patient characteristics

Age (mean ± SD)	67±11 years
Coronary Artery Disease	96%
Male	78%
Hypertension	61%
Diabetes	35%
Previous CABG	26%
Previous PCI	26%

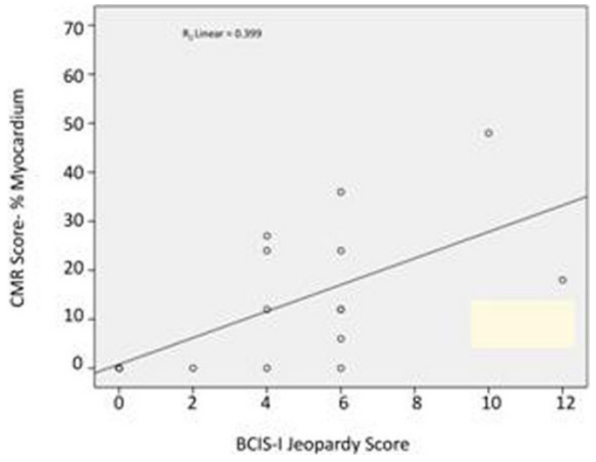

Figure 1 CMR Ischaemia/Scar Score versus JS st TFE perfusion cases

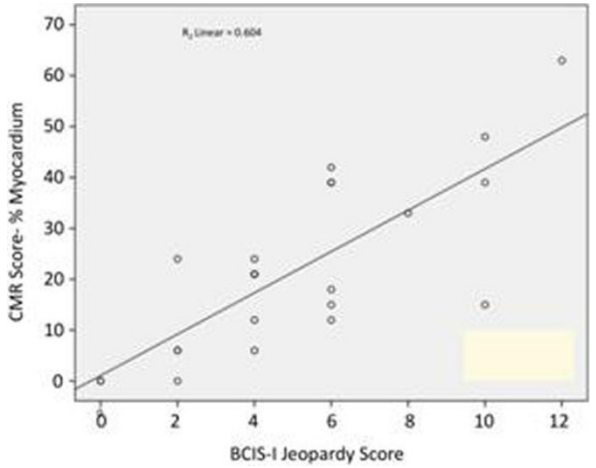

Figure 2 CMR Ischaemia/Scar Score versus JS kt TFE perfusion cases

Conclusions

There is a significant correlation between the anatomic JS and a functional CMR ischaemia/scar score. This correlation seems to improve with the use of a high-resolution perfusion technique. Complete correlation between the two scores would not be expected for reasons such as difficulty predicting the haemodynamic effects of anatomically moderate disease or post-revascularization when scar may be subtended by patent vessels. However, the correlation is likely to be clinically useful and using a high-resolution perfusion sequence may therefore be superior for imaging patients with CAD.

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