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This presentation will describe the methodology and clinical use of first pass myocardial perfusion MR imaging.

The method assesses the first myocardial passage of a peripherally injected, T1 shortening contrast agent. In order to detect myocardial ischaemia, CMR perfusion imaging is performed during vasodilator stress, induced usually by adenosine or dipyridamole. A 2007 meta-analysis of CMR myocardial perfusion showed an overall sensitivity of 91% and specificity of 81% for the detection of coronary artery disease by CMR perfusion analysis, using X-ray coronary angiography as the reference standard. CMR provides sufficient spatial resolution to delineate subendocardial perfusion, which is much more sensitive to ischaemia than the subepicardial layer. This is an important advantage of CMR over Nuclear perfusion imaging. Several single centre studies and one larger multicenter trial in 234 patients compared the performance of first-pass perfusion-cardiac magnetic resonance with SPECT and found that CMR was not inferior to SPECT for the detection of IHD. Two larger studies are due to report soon (IMPACT 2: >500 patients and CEMARC: 750 patients). Until these larger studies have reported, it cannot be conclusively stated whether CMR may be a viable or superior alternative to SPECT or PET for assessment of myocardial perfusion.

Several studies have now confirmed that CMR myocardial perfusion imaging can be used to determine a patient's prognosis. Following a normal CMR perfusion study, the cumulative event rate over the first two years has been shown to be 0.7% (12), which is similar to that following a normal SPECT study.

Analysis of CMR myocardial perfusion imaging should be in accordance with the 17-segment American Heart Association model. Perfusion defects should be graded according to transmural extent. Stress perfusion images should be compared with late gadolinium enhancement (+/- rest perfusion images – see earlier discussion) to identify inducible ischaemia, infarction, artefacts and normal areas of perfusion.