

MRI Evaluation of Chest Pain Compatible with Myocardial Ischemia

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Introduction: Current methods of evaluating patients presenting with chest pain using clinical parameters and an electrocardiogram are limited by low sensitivities especially in the groups with low or intermediate probability of acute myocardial infarction. The diagnostic value of a noninvasive means to evaluate and risk stratify these patients in the emergency room has been recognized. Cine cardiac magnetic resonance imaging (CMRI) has the ability to assess regional contractile function, myocardial perfusion, and myocardial tissue characteristics at high resolution. This abstract presents results of the pilot phase of our study in using CMRI as an urgent assessment of patients presenting with symptoms of acute coronary syndromes.

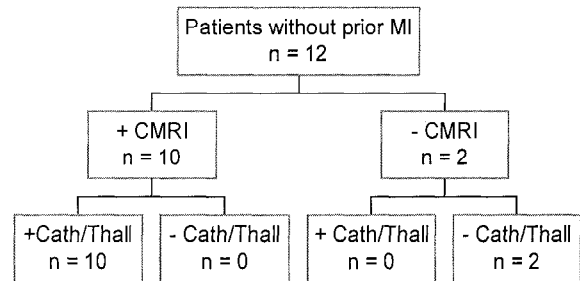
Methods: Patients presenting with symptoms and signs of acute coronary syndromes were initially triaged by the emergency room (ER) medical staffs. Those with significant ST elevation consistent with acute myocardial infarction were excluded from the study and received standard cardiac treatments. Patients with hemodynamic instability, significant hepatic or renal dysfunction, active pregnancy, and presence of metallic implants hazardous to MRI scanning were also excluded from the study. Patients studied were either from the ER or Cardiac Care Unit (CCU) within 24 hours of admission. CMRI studies were performed when patients were deemed clinically stable by their attending physicians. Cardiac gated, breathhold, multiphase, fast gradient recalled echo CMRI in long and short axis planes were obtained for detecting regional wall motion abnormality (RWMA). Multiphase, multislice first pass perfusion images with weight-based intravenous gadolinium injection were obtained for detecting resting first pass perfusion defect (HYPO). 10 of the 15 patients also had delayed images approximately 5 minutes after contrast injection for detecting regional myocardial hyperenhancement (HYPER). The imaging protocol was developed that allowed the acquisition of a complete study in approximately 30 minutes. All patients were monitored with telemetry throughout the entire study.

Results: 15 patients (10 males, 5 females) presenting with possible myocardial ischemia or infarction were studied. Mean age was 69 +/- 11 years old. CMRI were completed in an average of 34 +/- 7 minutes. 10(66%) of the 15 patients had intravenous nitroglycerin or heparin infusions throughout the CMRI study. There were no complications during CMR and image quality was not significantly affected by concurrent use of intravenous pumps. No patient developed recurrent chest pain or significant arrhythmias that required study termination.

Three patients had a history of myocardial infarction and showed either RWMA or HYPO on CMRI, and were subsequently found to have significant CAD on coronary angiography requiring intervention.

Among the 12 patients with no history of myocardial infarction, 10(83%) patients showed abnormality on CMRI which included either RWMA or HYPO, and 6(50%) showed both RWMA and HYPO. All 10 patients with an abnormality on CMRI were subsequently found to have significant CAD by conventional imaging including coronary angiography or stress thallium scintigraphy. 9 had significant coronary stenosis on angiography and 1 had a reversible defect suggestive of ischemia on stress thallium scintigraphy. In all 10 cases, the region of RWMA or HYPO correlated to myocardial supplied by culprit coronary stenosis or three-vessel disease. All 10 patients underwent

coronary interventions. When both RWMA and HYPO were seen, they occurred in the same myocardial segment. The two patients who had normal wall motion and normal first pass perfusion on CMRI had negative findings on subsequent conventional imaging, and no elevation of serum cardiac troponin over 24 hours.



Among the 12 patients with no history of myocardial infarction, 5(42%) patients developed a serum cardiac troponin elevation within 24 hours of admission. Average peak troponin level was 12.3 +/- 14.3 ng/ml. All 5 patients had either RWMA or HYPO on CMRI.

Conclusions: In summary, assessment of patients presented to emergency room with possible acute coronary syndromes with CMRI is feasible and safe. A study that includes assessment of regional left ventricular function, myocardial perfusion and tissue characteristics could be achieved in approximately 34 minutes. Concurrent intravenous infusion during CMRI scanning did not cause major technical problem during scanning.

Preliminary findings suggest that presence of either RWMA or HYPO is a sensitive marker for significant. It also appears that a concordance exists between the region of RWMA or HYPO and the region of myocardium supplied by the most critical coronary stenosis. Clinical validation of this imaging modality in patients with acute coronary syndromes awaits results from the active phase of this trial.

Reference

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