Refinements in MRI technique continue to show promise in clarifying the nature and extent of damage of myocardial infarction. Take for example teams from Munich, Germany presenting this week at ECR 2011, who have been finding ways around the problem of adapting inversion time to the individual patient when using delayed enhancement to detect tissue damage.

Merely mapping T1 values obtained with late gadolinium enhancement (LGE) on a 1.5 T Siemens MRI scanner revealed significant differences between normal and infarcted myocardium, according to a study by radiologist Kerstin Baumer, MD, and a team at the University of Munich, who used the left ventricular cavity as a reference in analyzing scans of 18 patients who showed chronic MI six months after the initial infarction. This was true whether or not the images were contrast enhanced, said Baumer.

In the nearby MRI Clinic at the Technical University of Munich, Armin Huber and his colleagues examined 19 patients with evidence of MI, comparing the data from delayed contrast images from a 1.5 T Philips scanner assessed in two different ways: using phase-sensitive inversion recovery (PSIR) and with individually adapted inversion times.

Not only does the PSIR analysis allow them to take five slices of the myocardium, rather than one, with one breath-hold, Huber reported, the determinations of infarct shape and volume were similar. The resolution on the PSIR images was clearly better, which should be an advantage for smaller lesions, he added.

Radiologists fortunate enough to have access to a 3 T MRI scanner can expect even better results from cardiac MRI, to judge from the evidence presented by Peter Bernhardt of the University Clinic in Ulm, Germany.

Radiologists there scanned 52 patients suspected of having coronary artery disease (judging from their average Framingham Risk Scores of 15) with Gd-DOTA enhanced MRI at both 1.5 T and 3 T, after assessing their condition with coronary angiography and adenosine-stress perfusion testing. The order of the different MRI tests was randomized, and readers were blinded to the results of other tests. The specificity and sensitivity of 3 T MRI were significantly better than 1.5 T at detecting stenosis in both the left anterior descending and left circumflex artery but not, curiously, in the right coronary artery.

"There's a much bigger contrast to noise ratio at 3-T," said Bernhardt, allowing a reduction in contrast medium. Studies before the experiment predicted that a 0.075 mmol/kg would produce better results at 3 T than 0.1 mmol/kg at 1.5 T, and this proved to be the case.

After four years of trying, radiologists at University Hospital Bichat in Paris have succeeded in validating diffusion-weighted imaging (DWI), which has proven most useful to date in diagnosing stroke, as a method of differentiating recent from chronic infarction. Their objective is to use it in emergency patients, because it produces immediate results with no need for an injection. Also in this study, observers were blinded to the results of other tests (T2 and cine MRI) when assessing 1.5 T diffusion weighted images from four groups of patients: 34 with a recent MI, 22 with subacute infarction, 18 with chronic infarction, and 24 healthy controls.

"We found a statistically significant difference in the quantitative values of DWI between healthy individuals and the different clinical groups," said Jean-Claude Laissy, and qualitative assessment suggested a sensitivity of 97 percent and a specificity of 61 percent in differentiating chronic from recent infarction. However, the distinction between recent and subacute injury was poor, with a specificity of only 14 percent. Certainly combining DWI and LGE, he said, will accurately tell the difference between recent and chronic in an emergency setting.
DWI is also valuable for assessing cardiac edema, according to one of several reports from a team from Italy that is using cardiac MRI to provide new insights into the pathophysiology of infarction. [Abstract B-094] Two other studies from the Catholic University of the Sacred Heart in Rome have clarified the events that make left ventricular remodeling so dangerous for patients after MI. Using a standard cardiac MRI protocol, radiologists there studied 22 patients seven days and again six months after their first MI, looking for signs of left ventricular remodeling, which has been associated with adverse outcomes. They found evidence of remodeling (mean end diastolic volume and mean end diastolic volume had increased by more than 20 percent) in 14 patients at six months after infarction. On MRI, these patients showed a higher number of segments with more than 75 percent of transmural perfusion defects, said Ferdinando Ferrara. This is an indication of macrovascular obstruction, which is another bad sign after MI. According to animal experiments, hemorrhage may soon follow. But are the obstruction and the hemorrhage two separate events, or part of the same destructive process?

Using T2* measurements in 35 patients treated with PCI for their first myocardial infarction, the Rome team found that all patients who had lower T2* values (between 12 and 18 ms) who had signs of hemorrhage also showed macrovascular obstruction. The two abnormalities represent the same type of complication, they conclude.

Disclosures:

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