News and Views From the Literature

Cardiac Imaging

Multislice Coronary Computed Tomography and Magnetic Resonance Imaging in the Cardiology Practice

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Midterm Prognosis of Patients With Suspected Coronary Artery Disease and Normal Multislice Computed Tomographic Findings

Gilard M, Le Gal G, Cornily JC, et al.

Arch Intern Med. 2007;167:1686-1689

Accuracy of 64-Slice Computed Tomography for the Preoperative Detection of Coronary Artery Disease in Patients With Chronic Aortic Regurgitation

Scheffel H, Leschka S, Plass A, et al.

Am J Cardiol. 2007;100:701-706

Usefulness of 64-Slice Multislice Computed Tomography Coronary Angiography to Assess In-Stent Restenosis

Cademartiri F, Schuijf JD, Pugliese F, et al.

J Am Coll Cardiol. 2007;49:2204-2210

Cardiovascular Magnetic Resonance Perfusion Imaging at 3-Tesla for the Detection of Coronary Artery Disease: A Comparison With 1.5-Tesla

Cheng AS, Pegg TJ, Karamitsos TD, et al.

J Am Coll Cardiol. 2007;49:2440-2449

The common theme of the first 3 of these articles is the increased relevance of multislice coronary computed tomography (MSCT) in the day-to-day practice of cardiology. The fourth article addresses the capabilities of 3-Tesla (3-T) magnetic resonance (MR) in detecting significant coronary artery disease (CAD). MR imaging has the capability of providing excellent predictive accuracy while avoiding exposure to the radiation inherent in nuclear perfusion imaging.

Computed Tomography

Gilard and colleagues[1] describe a prospective outcome study of 141 patients who were scheduled to undergo conventional coronary angiography (CCA) for evaluation of CAD. Patients presented with either typical chest pain and inconclusive functional testing or no symptoms and a positive functional test. Exclusion criteria included

known CAD, acute coronary syndrome, irregular heart rate, and chronic kidney disease.

During the mean follow-up period of 14.7 months, mortality was 0%, myocardial infarction was 0.7%, and the need for subsequent CCA due to worsening chest pain syndromes was 3.5%. Of the 5 patients who presented with worsening symptoms while undergoing CCA, 3 were found to have significant lesions and 2 had no significant disease. The MSCT scans of the 3 patients with clinical events were re-reviewed, and the investigators noted nonhemodynamically significant calcification that for some reason had been overlooked as normal during the original review.

This clinical trial shows that MSCT can be used to stratify patients into a very low risk cardiovascular event group, while sparing them the small but significant vascular risks associated with CCA. There were 2 shortcomings of this clinical evaluation: the MSCT evaluations were performed on older, 16-slice CT scan technology and, more importantly, calcified plaque was considered a normal finding. My colleagues and I have performed more than 6000 MSCT studies at Westside Medical Imaging in Beverly Hills, CA, and based on our experience, we feel much more comfortable defining a "normal" MSCT as one without any calcified or noncalcified plaque at all. If this definition had been used in this study, the investigators would have identified all patients at very low risk of a cardiovascular event. This study reinforces the notion that coronary artery plaque rupture often occurs on nonobstructive plaques, and that clinicians should not be lulled into a false sense of security when any amount of disease, no matter how diffuse or severe, can predispose to development of unstable plaque.

The study by Scheffel and colleagues[2] evaluated the diagnostic accuracy of 64-slice MSCT in detecting CAD in patients with chronic aortic insufficiency. For a preoperative assessment of CAD prior to valve surgery, 50 patients underwent both MSCT and CCA. Of the 742 coronary artery segments evaluated in these 50 patients by MSCT, only 1.8% were considered nondiagnostic. These segments were all located in distal coronary artery segments and were noninterpretable due to motion artifacts or calcium. Sensitivity was 100%, specificity was 95%, positive predictive accuracy was 87%, and negative predictive accuracy was 100%. Scheffel and colleagues[2] determined that CCA could have been avoided in 70% of cases, and unnecessary CCA would have been performed in 4% of patients.

MSCT in this population cohort seems to have the diagnostic power to provide the cardiac surgeon with the information necessary to decide whether to perform coronary revascularization. A clear advantage of MSCT over CCA is the ability to evaluate both the aortic root and the ascending aorta for dilation and aneurysm, a particularly important issue in patients with bicuspid aortic valves and evidence of aortic root dilation on echocardiography.

Another area in which MSCT may have clinical utility is in the assessment of patients for coronary artery stent restenosis. Cademartiri and colleagues[3] evaluated 182 patients who underwent coronary stent implantation either as part of a routine follow-up in experimental protocols or due to concern for restenosis. Patients with atrial fibrillation, chronic kidney disease, and allergy to contrast were excluded from this trial. Patients had undergone stent implantation an average of 6 months before the study, and had undergone CCA within 1 month of the MSCT evaluation. The average stent diameter was 3.1 mm (range 2.5 to 4.5 mm) and stent length was 8 to 33 mm, with an average of 18 mm. A total of 7.3% of stented segments were excluded from analysis due to poor image quality. MSCT identified in-stent restenosis with sensitivity of 95%, specificity of 85%, positive predictive accuracy of 63%, and negative predictive accuracy of 99%.

In our clinical practice, we have found MSCT to be useful in identifying patients with either a clinical presentation consistent with restenosis or evidence of inducible ischemia on stress testing. MSCT seems to be able to rule out the presence of restenosis in patients who have regular heart rates or faster heart rates that can be slowed to normal levels with beta-blockers when necessary for imaging. In addition, we have found MSCT to be useful in evaluating for evidence of disease progression in other coronary artery segments. One shortcoming of MSCT is that it does not determine whether observed restenosis reaches a threshold to induce ischemia. In addition, it has been our experience that evaluating for stent restenosis becomes more difficult in side branches that are less than 2.5 mm in diameter, obese patients (> 150 kg), patients with irregular heart rates, and patients with calcium scores exceeding 1500.

Magnetic Resonance Imaging

Cheng and colleagues[4] compared 1.5-T MR with 3-T MR for the detection of significant CAD. The 61 patients who were referred for elective coronary angiography were studied with first-pass perfusion cardiac MR at both 1.5-T and 3-T and with a chemical stress of intravenous adenosine (140 μg/kg/min) and rest.

The 3-T cardiac MR was superior to the 1.5-T cardiac MR in diagnostic accuracy (90% vs 82%), sensitivity (98% vs 90%), specificity (76% vs 67%), positive predictive

accuracy (89% vs 84%), and negative predictive accuracy (94% vs 78%). The enhanced results are probably due to the improved signal-to-noise ratio with the higher-field strength. It therefore seems likely that 3-T may become the preferred cardiac MR field strength of choice for performance of myocardial perfusion assessments. ■

References

1. Gilard M, Le Gal G, Cornily JC, et al. Midterm prognosis of patients with suspected coronary artery disease and normal multislice computed tomographic findings. *Arch Intern Med.* 2007;167:1686-1689.
2. Scheffel H, Leschka S, Plass A, et al. Accuracy of 64-slice computed tomography for the preoperative detection of coronary artery disease in patients with chronic aortic regurgitation. *Am J Cardiol.* 2007;100:701-706.
3. Cademartiri F, Schuijf JD, Pugliese F, et al. Usefulness of 64-slice multislice computed tomography coronary angiography to assess in-stent restenosis. *J Am Coll Cardiol.* 2007;49:2204-2210.
4. Cheng AS, Pegg TJ, Karamitsos TD, et al. Cardiovascular magnetic resonance perfusion imaging at 3-tesla for the detection of coronary artery disease: a comparison with 1.5-tesla. *J Am Coll Cardiol.* 2007;49:2440-2449.

Acute Coronary Syndrome

Cardiovascular Events After Clopidogrel Discontinuation

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Incidence of Death and Acute Myocardial Infarction Associated With Stopping Clopidogrel After Acute Coronary Syndrome

Ho PM, Peterson ED, Wang L, et al.

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Clopidogrel is currently recommended for all patients following an acute coronary syndrome (ACS) event. Although patients treated medically or with a bare-metal stent should remain on clopidogrel for at least 1 month (and ideally up to 1 year), those with a drug-eluting stent are recommended to be maintained on the drug for at least 1 year.[1] Previously, a "rebound effect" has been demonstrated with some cardiovascular drugs, like aspirin, heparin, and beta-blockers, with patients experiencing a clustering of acute events following abrupt cessation of drug therapy.[2-4] A recent study has demonstrated an increase in platelet and inflammatory biomarkers after discontinuation of thienopyridine therapy in diabetic patients with coronary artery disease.[5] As a result, concerns have been expressed about a possible rebound effect from clopidogrel.[6]

To explore whether a "clopidogrel rebound" exists for clinical events, Ho and colleagues[7] retrospectively evaluated the frequency and timing of adverse events (a composite of all-cause mortality or acute myocardial infarction [AMI]) following cessation of clopidogrel therapy for ACS. The study cohort consisted of 3137 ACS patients from 127 Veterans Affairs hospitals who had been discharged on clopidogrel therapy. Duration of clopidogrel usage was indirectly derived using prescription refill data from pharmacy dispensing records, introducing a probable source of bias. Results were analyzed separately for patient groups managed medically or with percutaneous coronary intervention (PCI).

In the 1568 patients in the medical management group, mean duration of clopidogrel was 302 (± 151) days. Follow-up information for these patients was gathered at a mean of 196 (± 152) days after clopidogrel treatment was stopped. Prevalence of comorbid conditions was higher in this group. Death (n = 155) or AMI (n = 113) occurred in 17.1% of these patients. A preponderance of adverse events (60.8%) occurred during the initial 90-day interval after clopidogrel was discontinued. Only 9.7% of the adverse events occurred during 181 to 270 days of follow-up. Even after adjustment for duration of clopidogrel therapy as part of a multivariable analysis, the initial 90-day period was associated with an approximate 2-fold risk of death or AMI compared with the next 91 to 180 days (incidence rate ratio [IRR], 1.98; 95% confidence interval [CI], 1.46-2.69).

Similar findings were demonstrated in 1569 PCI-treated ACS patients. Mean duration of clopidogrel treatment was 278 (± 169) days, and patients were monitored for 203 (± 148) days after stopping the drug. All-cause mortality (n = 68) or AMI (n = 56) occurred in 7.9% of the patients. A majority of events (58.9%) occurred between 0 and 90 days after clopidogrel was discontinued. As in the medically managed group, the risk for adverse events (IRR, 1.82; 95% CI, 1.17-2.83) was approximately double during the first 90 days after discontinuation of the drug, even after adjustment for multiple covariates.