

Calcium Scoring Useful in Intermediate CHD Risk

BY KERRI WACHTER
Senior Writer

Coronary artery calcium scoring by CT can be considered as a useful tool in the evaluation of asymptomatic patients with an intermediate risk of coronary heart disease but not those with low or high risk, according to expert consensus.

On Jan. 23, the American College of Cardiology Foundation and the American Heart Association jointly released an expert consensus document that updates information and opinion on coronary artery calcium (CAC) scoring by CT, particularly with regard to global cardiovascular risk assessment and evaluation of patients with chest pain (*J. Am. Coll. Cardiol.* 2007;49:378-402). The last consensus document on the use of electron-beam CT for the diagnosis and prognosis of coronary artery disease (CAD) was published in 2000.

On the basis of data available since that time, the committee concluded that CAC measurement using CT scanning is a reasonable tool for evaluating asymptomatic patients with a 10-year risk of estimated coronary heart disease (CHD)

events between 10% and 20%.

"The test does what it does very well—it detects calcium. It's a marker of atherosclerosis and ergo a marker of higher risk," said Dr. Robert O. Bonow, a member of the writing committee and chief of the division of cardiology at Northwestern Memorial Hospital in Chicago, in an interview.

With the intermediate group, CAC measurement could help cardiologists decide how aggressive to be with treatment.

However, the investigators advised against the use of CAC measurement in patients with low CHD risk (below 10% 10-year risk of estimated CHD events). They noted that CAC measurements in this patient group would be similar to using the technique for population screening, which the committee also counseled against.

Similarly, the authors advised against the use of CAC measurements in asymptomatic patients who have a high risk of CHD (greater than 20% 10-year risk of es-

timated CHD events or established coronary disease, or other high-risk diagnoses). Patients who fall under this category "should be treated aggressively consistent with secondary prevention goals based upon the current National Cholesterol Education Program III guidelines and thus should not require additional testing, including CAC scoring, to establish this risk evaluation," the researchers wrote.

Coronary artery calcium is 'a marker of atherosclerosis and ergo a marker of higher risk.'

DR. BONOW

bles your risk from 1% to 2%, it's still low risk," Dr. Bonow said. "If you're very high risk, it's high risk no matter what."

While the recommendations give the thumbs up to the use of CAC to evaluate patients with intermediate risk, the authors noted that there have been no head-to-head comparisons of CAC with other assessment tools. Some, such as ankle-brachial index or carotid ultrasound, may be less expensive.

There have also been no randomized tri-

als that demonstrate that CAC measurement improves outcomes. "This created a lot of discussion in the committee," Dr. Bonow said.

"The problem is that it's not clear that the trial will ever be done. Meanwhile, we have data that [CAC] might be a useful test in certain subsets of patients," he continued.

The committee also noted that the strongest CAC data are for white men. Until additional data in other groups are available, the authors recommended caution in extrapolating CAC data derived from these studies in women and ethnic minorities.

The committee also reviewed the use of CAC measurement in patients with diabetes. It has been documented in several cross-sectional studies that patients with diabetes have a higher prevalence and degree of coronary calcium than nondiabetic patients.

The authors noted that there is some evidence to suggest "that coronary calcium might be useful to further stratify short-term risk in diabetic patients." However, they cautioned that additional studies from nonreferral populations with longer follow-up are needed.



Imaging Methods Offer Options Beyond Echocardiography

BY SHERRY BOSCHERT
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SAN FRANCISCO — Echocardiography provides adequate imaging for most cardiac patients, but when more information is needed, clinicians choose from three imaging methods that bring different strengths and weaknesses.

Of the three options—CT scans, nuclear medicine, or cardiovascular magnetic resonance (CMR) imaging—the one that probably provides the most information and holds the greatest potential for future applications is CMR, Dr. Matthias G. Friedrich said at a meeting sponsored by the California chapter of the American College of Cardiology.

"If I had to pick one," it would be CMR, said Dr. Friedrich, director of the Stephenson Cardiovascular Magnetic Resonance Centre at the Libin Cardiovascular Institute of Alberta, Canada. He reported having no financial affiliation with companies that make the technologies that he discussed.

Dr. Friedrich weighed the advantages and disadvantages of each modality:

► **CT.** A CT scan provides excellent imaging of cardiovascular structures but is less helpful for assessing function or metabolism.

The spatial accuracy of CT scans is unbeaten for describing morphology. They are fast and

relatively easy to perform. "You push a button, and you wait for a couple of seconds. Then you wait for a couple of minutes to have the automatic CT rendering done. You get nice images," he said at the meeting, also sponsored by the University of California, San Francisco.

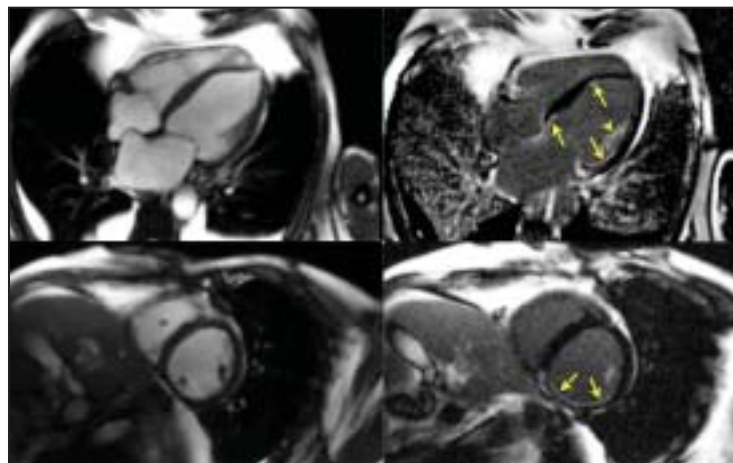
On the downside, 1 in every 1,000 patients undergoing CT scans will develop cancer from the radiation, he said. CT is not very good for tissue characterization or functional assessment, and not good at all for imaging blood flow. CT can visualize and quantify calcium, but calcium plaques generally provide little prognostic value. The technology is approaching the peak of its capabilities.

"It does not have a huge future potential," he added.

► **Nuclear medicine.** Although very good at assessing metabolism, nuclear medicine is only so-so for imaging structures and is not very good at assessing function.

Its strengths are very specific metabolic information and strong prognostic value. A solid body of data shows that the extent of an ischemic lesion or perfusion deficit on nuclear imaging predicts the patient's prognosis.

Disadvantages of the approach include poor spatial resolution, radiation exposure, cost, poor assessment of flow, and uncertain



Cardiovascular magnetic resonance produced these functional (left) and structural images (right); arrows show infarcted areas.

availability of the tracer for PET scanning.

Some newer applications of nuclear cardiology may be more exciting, Dr. Friedrich said. Animal studies suggest that accumulation of a tracer may correlate with the activity of a plaque. Nuclear medicine may allow visualization of matrix metalloproteinases, an important component of plaque stability, or visualization of apoptosis. To overcome the poor spatial resolution, studies are underway to fuse CT and nuclear images to overlay anatomic images with metabolic details.

► **CMR.** Although not as good as nuclear medicine for assessing metabolism—"not yet, at least," he said—CMR provides good structural images and is very good for assessing function.

It is noninvasive, safe, and versatile. It is especially good at tissue characterization but also good for assessing function and flow. "It has the largest future potential because we have not started to exploit all the options in molecular imaging" with CMR, he said.

CMR is complex to perform, however, and it is costly because both image acquisition and evaluation take too long under current protocols.

"We're working on getting evaluations done in a few minutes" instead of the typical half-hour, he said.

Experimental uses of CMR suggest that it could allow clinicians to assess cardiac pathophysiology directly instead of surrogate markers, Dr. Friedrich said.

Recent, unpublished studies in animals report that CMR visualized ischemia-induced intracellular edema, which showed up before the irreversible injury of acute infarction.

Dr. Friedrich and his associates now are studying CMR for triage of emergency department patients with suspected acute coronary syndrome who don't have troponin levels or echocardiography results that warrant sending them straight to the catheterization lab.

"According to the guidelines, you have to wait a couple of hours and repeat the troponin. If you are unlucky, this was an infarct, and during those 4, 6, or 10 hours you have lost most of the myocardium you could have salvaged," he said.

Under their CMR protocol, intracellular edema can be identified quickly, and those patients are sent to the cath lab within minutes of intake. Patients with negative results in the multistep protocol are being sent home before ordering a second troponin test.

"This is just one example where tissue characterization, without using a contrast agent, can be very, very helpful in a daily clinical setting," he said. He estimated that the hospital would save \$1 million Canadian dollars per year from the earlier discharges and avoidance of extra exercise stress tests.

PHOTOS COURTESY DR. MATTHIAS G. FRIEDRICH