Framingham and NCEP risk scores correlate poorly with plaque burden on CT

JANUARY 13, 2009 | Shelley Wood

New Haven, CT - Two of the most commonly used risk-stratification algorithms correlate poorly with coronary atherosclerotic plaque burden, a new study shows [**1**]. Authors of the study, led by **Dr Kevin M Johnson** (Yale University, New Haven, CT), say that risk stratification based on Framingham score or the **National Cholesterol Education Program** (NCEP) **Adult Treatment Panel III** (ATP III) is a "weak discriminator of the overall atherosclerotic plaque burden" and may lead to over- or undertreatment of patients.

Their paper is published in the January 2009 issue of the *American Journal of Roentgenology*.

In an interview with **heart**_wire_, Johnson called the Framingham risk estimate, which forms part of the NCEP ATP III risk-stratification algorithm, a "useful and venerable" tool but points out that it is derived from epidemiologic observations. As other studies have shown, Framingham predicts the risk of a coronary event only 60% to 65% of the time, he said. "When you turn around and you try to use that kind of epidemiological data to make a clinical decision in the doctor's office, it falls apart. Statistically, the discrimination that you can make is just not strong enough, because there will be a lot of people who have a low Framingham risk who have a lot of atherosclerotic plaque, and a lot of people with high risk, by Framingham score, with no plaque."

Seeing and believing

For their study, Johnson et al performed CT coronary angiography in 1653 patients with no history of CAD but who were experiencing atypical chest pain, were smokers, or had a family history of CAD, high blood pressure, or hypercholesterolemia. Amount of atherosclerotic plaque in different segments of the coronary tree, or degree of stenosis in each imaged segment, were used to derive a total plaque score. Roughly 30% of men and 46% of women were found to have no detectable plaque by coronary CT.

When these were correlated with 10-year risk estimates using Framingham, the degree of correlation was "modest" (Spearman's rank correlation coefficient 0.49-0.55). When NCEP risk categories were compared with plaque-score categories, the proportion of "raw agreement," statistically, was less than 0.50, and only 55% of patients deemed to be at moderate or high plaque burden fell into the corresponding categories of moderately high and high-risk NCEP categories. By contrast, more than one in 10 patients with no visible plaque on CT were deemed to be "moderately high" or "high-risk" according to NCEP, and 32% of patients with no detectable plaque were taking statins. Of all patients taking statins, 26% had plaque burden scores of zero. Conversely, when both CT angiography-derived plaque scores and NCEP risk criteria were used to determine whether a patient *not* taking a statin should be taking one, 21% of patients would have their "perceived need for a statin" altered if the plaque score, as opposed to the NCEP risk-stratification scheme, was employed.

"Under the risk-factor approach, many patients with little or no plaque would be subjected to lifelong drug therapy, whereas many others with substantial plaque would be undertreated or not treated at all," the authors write.

To **heart***wire*, Johnson pointed out that professional society guidelines from the **AHA** and **ACC** "still take the approach that if you're Framingham low risk, you don't need any further imaging. And my point is, it's not appropriate to use the Framingham risk estimate as the first step in the screening process, because the sensitivity is poor."

Yet another call for outcomes data

But an overarching limitation of Johnson et al's study—quickly pointed out to **heart***wire* by Johnson himself—is that the studies conclusively linking findings on CT angiography to clinical outcomes have not been completed.

"That's the caveat," Johnson said. Their paper examined how Framingham and NCEP stack up against plaque burden, but the use of CT angiography itself as the standard has its share of problems. "This is assuming that the more plaque you have, the worse it is for you, and that's still in the process of being proven," he said. "It's sort of widely accepted, and there's a lot of evidence for it, but that's really still being nailed down."

The authors also point out that there is no accepted scoring system for quantifying total coronary plaque burden using CT angiography in the way that there is for coronary calcium scans. In their study, Johnson et al visually estimated plaque burden on a per-segment basis, assigning it a score out of four, then used three other methods of comparison—a time-consuming process suitable to a research study, but not in the clinical setting. What's needed, they write, is a consensus-based method that could also be helpful clinically.

For now, Johnson, a radiologist, was careful to say that his study did not mean that cardiologists should abandon Framingham and other risk-scoring algorithms but that imaging will certainly play a bigger role in future risk assessments.

"Cardiologists are very well organized; they really put out very careful guidelines," he said. "They will sort this all out in the next couple of years, but in the meantime, we do have this incredibly powerful imaging technique that can give us a direct view of the arteries."

Then the question will be how functional testing fits with the risk algorithms and imaging results, Johnson predicts. "That's why we need the outcome studies."

Johnson disclosed having no relevant financial conflicts of interest. Disclosures for study coauthors are listed in the paper.

Source

1. Johnson KM, Dowe DA, Brink JA. Traditional clinical risk assessment tools do not accurately predict coronary atherosclerotic plaque burden: a CT angiography study. *Am J Roentgenol* 2009; 192:235-243.
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