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A Non-Biased Assessment of the Usefulness of Computed Tomographic Angiography

Jonathan M. Tobis, MD*

The report by Shapiro et al¹ on the accuracy of computed tomographic angiography (CTA) is a breath of fresh air in an area of cardiac imaging that is based more on financial self-interest and flashy marketing than on science. The investigators compared the results of CTA with direct coronary angiography and found that this technique is accurate when the amount of calcium is small. However, patients with minimal calcification tend to have normal coronary arteries or less severe disease, and presumably, standard techniques for identifying the presence of significant coronary obstructions would suffice in this group, without exposure to the higher dose of radiation associated with CTA. In patients with more complex atherosclerotic disease, the presence of calcium interferes with the accurate assessment of the severity of stenosis determined by CTA. In the study by Shapiro et al, the computed tomographic angiographic examination results could not be evaluated in 13% of segments. When these segments were included in the analysis, the predictive value decreased from 96% to 60%. However, these are exactly the segments that we need to know about in our clinical practice assessment.

Therefore, the sensitivity of CTA will depend on the percentage of patients studied who have significant calcification. One would expect reports to vary among studies in the published research on the basis of the pretest likelihood of calcification in the populations studied. For example, computed tomographic angiographic studies that include large percentages of younger, normal subjects are likely to report high sensitivity and specificity, whereas those including patients with previous coronary artery stents or 3-vessel disease, diabetes, or renal disease would be more likely to have high proportions of uninterpretable computed tomographic angiographic examination results. Unfortunately, the latter groups are precisely the ones that are more likely

to require frequent tests to determine the presence of coronary stenosis. Shapiro et al should be commended for recognizing the practical limitations of CTA. As they conclude, "the clinical utility of coronary CTA may be limited by a low positive predictive value in patients with a high prevalence of disease."

CTA is not a meaningful alternative to invasive coronary angiography for the most vulnerable patients, in whom cardiologists need to know unequivocally whether significant disease is present. The proliferation of computed tomographic angiographic examinations appears to be stimulated primarily by financial motivation, not scientific justification, because CTA does not provide equivalent information compared with coronary angiography, or even other available noninvasive tests. The holy grail of a safe, noninvasive method to image the coronary anatomy is still illusive. The current capability of CTA is unfortunately not the answer. Instead of decreasing the need for coronary angiography, invasive cardiologists are seeing more patients referred for coronary angiograms because they have been falsely diagnosed as having stenoses by CTA. If these patients are symptomatic with true angina, they probably could have been diagnosed noninvasively without CTA and will require coronary angiography anyway. If these patients are asymptomatic, it is likely that CTA has rendered false-positive results because of the presence of calcification and the overestimation of disease severity. There are times when CTA is useful, such as for the diagnosis of vein graft or left internal mammary artery patency, but as a routine examination to diagnose the presence or severity of coronary artery disease, CTA has been overhyped and oversold. In general, patients will be better served by standard radionuclide stress testing and, if those results are positive, routine coronary angiography.

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1. Shapiro MD, Butler J, Rieber J, Sheth TN, Cury RL, Ferencik M, Nichols JH, Goehler A, Abbara S, Pena AH, Brady TJ, Hoffman U. Analytic approaches to establish the diagnostic accuracy of coronary computed tomography angiography as a tool for clinical decision making. *Am J Cardiol* 2007;99:1122-1127.