

Comparison of Multidetector Computed Tomography with Coronary Angiography

Hoffmann U, Moselewski F, Cury RC, et al. Predictive value of 16-slice multidetector spiral computed tomography to detect significant obstructive coronary artery disease in patients at high risk for coronary artery disease: patient- versus segment-based analysis. Circulation 2004;110:2638–43.

Study Overview

Objective. To evaluate the diagnostic value of multidetector computed tomography (MDCT) for the detection of obstructive coronary artery disease (CAD) in high-risk patients.

Design. Prospective, blinded, cross-sectional technology assessment.

Setting and participants. 33 consecutive patients with chest pain and a noninvasive cardiac test result suggesting myocardial ischemia underwent 16-slice MDCT and selective coronary angiography

Main outcome measures. Sensitivity, specificity, and positive and negative predictive values per coronary artery segment and per patient of MDCT compared with coronary angiography for obstructive CAD.

Main results. 67% of patients had obstructive CAD (> 50% stenosis) on coronary angiography. By analysis of 530 coronary artery segments, MDCT had a sensitivity of 63%, specificity of 96%, positive predictive value of 64%, and negative predictive value of 96% for the detection of significant coronary stenoses. By patient, MDCT had a sensitivity of 86%, specificity of 82%, positive predictive value of 90%, and negative predictive value of 75%.

Conclusion. Among high-risk patients, the diagnostic value of MDCT for obstructive CAD was only modest.

Commentary

Coronary angiography defines the extent of flow-limiting

CAD and is the precursor to planning revascularization. The expense, recovery time, and risk of complications associated with angiography provide the impetus for developing less invasive imaging techniques using computed tomography. The study by Hoffmann et al demonstrates that MDCT, even when performed in a research setting, is not yet an acceptable alternative to angiography. Among high-risk patients, too many significant stenoses were missed (20 of 54 stenoses; sensitivity, 63%), and the negative predictive value was unacceptably low.

The authors are correct to emphasize the results of the patient-level analysis, which give us a better understanding than the segment-level results of how this technique would perform in real clinical situations. Since some patients had multiple stenoses, the sensitivity at the patient level was higher (86%) but still not adequate to exclude significant CAD. If this approach were applied to a lower risk population (who would be expected to have a lower incidence of multivessel disease), the sensitivity at the patient level would be lower than what was observed here. Furthermore, even though the specificity at the segment-level analysis is high (96%), because each patient has multiple segments, patient-level specificity is lower (82%), and in a lower risk population the positive predictive value could be much lower than what was observed here.

Applications for Clinical Practice

Among patients at high risk for CAD, 25% who had a negative result by MDCT had obstructive CAD. MDCT should not be used as a replacement for coronary angiography at this time.

—Review by Stephen D. Persell, MD, MPH

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