

Computed tomographic angiography had high sensitivity for coronary artery disease in patients at intermediate risk

Hausleiter J, Meyer T, Hadamitzky M, et al. Non-invasive coronary computed tomographic angiography for patients with suspected coronary artery disease: the Coronary Angiography by Computed Tomography with the Use of a Submillimeter resolution (CACTUS) trial. *Eur Heart J*. 2007;28:3034-41.

Clinical impact ratings: Cardiology ★★★★★☆☆

QUESTION

How accurate is multislice spiral computed tomography (MSCT) for diagnosing coronary artery disease (CAD) in patients at intermediate risk?

METHODS

Design: Blinded comparison of MSCT and invasive coronary angiography.

Setting: Cardiology clinic in Munich, Germany.

Patients: 243 patients ≥ 40 years of age (mean age 62 y, 65% men, 69% with chest pain) who were scheduled for elective invasive coronary angiography and were at intermediate risk for CAD (presence of chest pain, dyspnea, or intermittent arrhythmias with a negative or equivocal stress test; or absence of symptoms with a positive stress test). Exclusion criteria included absence of sinus rhythm, known CAD, contraindication to iodinated contrast agents, and pregnancy.

Description of test: Coronary artery MSCT using a 16-slice (first year of study) or 64-slice (second year) scanner. Metoprolol was used for heart rate control and sublingual nitroglycerin for coronary vasodilatation during the study. Patients with ≥ 1 segment with

$\geq 50\%$ lumen narrowing or inconclusive results (because of coronary calcification or severe motion artifact) were considered to have a positive test.

Diagnostic standard: Conventional invasive coronary angiography. Patients with ≥ 1 segment (≥ 2 mm at the origin) with $\geq 50\%$ lumen narrowing were considered to have CAD.

Outcomes: Sensitivity, specificity, and positive (+LR) and negative (-LR) likelihood ratios.

MAIN RESULTS

42% of patients were diagnosed with CAD, and 9.6% of 2683 arterial segments examined were considered to have $\geq 50\%$ stenosis. Diagnostic characteristics of MSCT are shown in the Table. The MSCT results were inconclusive in 11% of patients. The inci-

dence of inconclusive findings was higher (thus leading to lower specificity) with 16-slice compared with 64-slice MSCT (11% vs 8% of segments), in patients with higher compared with lower levels of coronary artery calcification (44% vs 6%), and in patients with heart rate ≥ 65 beats/min compared with < 65 beats/min (38% vs 6.7%).

CONCLUSION

Multislice spiral computed tomography had high sensitivity and moderate specificity for diagnosing coronary artery disease in patients at intermediate risk.

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Diagnostic test characteristics of multislice spiral computed tomography compared with invasive coronary angiography for diagnosis of coronary artery disease ($\geq 50\%$ lumen narrowing) in patients at intermediate risk*

Level of diagnosis	Number studied	Sensitivity (95% CI)	Specificity (CI)	+LR	-LR
Patient	243	99% (94 to 99)	75% (67 to 82)	4.0	0.01
Arterial segment	2683	95% (88 to 95)	90% (87 to 92)	9.5	0.06

*Diagnostic terms defined in Glossary. LRs calculated from data in article.

COMMENTARY

The appropriate use of any rapidly improving technology is difficult to define, and coronary angiography with computed tomography (CT-angio) is no exception (1). In the study by Hausleiter and colleagues, CT-angio with a 64-slice scanner had per-segment sensitivity and specificity $> 90\%$. The improved resolution probably contributed to the low number of patients with poor images, all of whom were included in the analysis. Another strength of the study is the sample of intermediate-risk patients who are most likely to benefit from the test findings. Assuming that the results of this study can be extrapolated to regular practice, CT-angio seems to be useful as an alternative to traditional angiography in patients with an intermediate probability of CAD, particularly those concerned about having an invasive procedure. The high negative predictive value of CT-angio (99%) means that a negative result would end ischemic evaluation in $> 40\%$ of patients.

CT-angio may have an even more important role as the initial diagnostic test, particularly when combined with a calcium score. If the initial calcium score is 0, coronary disease is very unlikely, although 1-vessel disease may be observed in $\leq 10\%$ of patients. If the calcium score is > 1000 (as is the case in 10% of patients with an intermediate probability of disease), the CT-angio could be cancelled and plans made for standard angiography given the high prevalence of obstructive CAD (83% in the Hausleiter study) and the reduced accuracy of CT-angio because of artifacts.

Appropriate concern exists that the availability of CT-angio will lead to more imaging tests per patient with no increase in diagnostic efficiency. Radiation dose is another concern and is higher with the higher-resolution CT-angio protocols. However, radiation dose is decreasing as investigators make protocol modifications that can significantly reduce exposure. Future studies will need to evaluate the effect of diagnostic strategies using CT-angio (rather than the test in isolation) on diagnosis, resource use, and outcomes.

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Reference

- Hendel RC, Patel MR, Kramer CM, et al. ACCF/ACR/SCCT/SCMR/ASNC/NASCI/SCAI/SIR 2006 appropriateness criteria for cardiac computed tomography and cardiac magnetic resonance imaging: a report of the American College of Cardiology Foundation Quality Strategic Directions Committee Appropriateness Criteria Working Group, American College of Radiology, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, American Society of Nuclear Cardiology, North American Society for Cardiac Imaging, Society for Cardiovascular Angiography and Interventions, and Society of Interventional Radiology. *J Am Coll Cardiol*. 2006;48:1475-97.