Circulation (2004);109:14-7
Detection of calcified and noncalcified coronary atherosclerotic plaque by contrast-enhanced, submillimeter multidetector spiral computed tomography: a segment-based comparison with intravascular ultrasound
S. Achenbach*, et al.*
Department of Radiology, Massachusetts General Hospital, Boston, USA.
Stephan.achenbach@med2.med.uni-erlangen.de
BACKGROUND: We investigated the ability of multidetector spiral computed tomography (MDCT) to detect atherosclerotic plaque in nonstenotic coronary arteries. METHODS AND RESULTS: In 22 patients without significant coronary stenoses, contrast-enhanced MDCT (0.75-mm collimation, 420-ms rotation) and intravascular ultrasound (IVUS) of one coronary artery were performed. A total of 83 coronary segments were imaged by IVUS (left main, 19; left anterior descending, 51; left circumflex, 4; right coronary, 9). MDCT data sets were evaluated for the presence and volume of plaque in the coronary artery segments. Results were compared with IVUS in a blinded fashion. For the detection of segments with any plaque, MDCT had a sensitivity of 82% (41 of 50) and specificity of 88% (29 of 33). For calcified plaque, sensitivity was 94% (33 of 36) and specificity 94% (45 of 47). Coronary segments containing noncalcified plaque were detected with a sensitivity of 78% (35 of 45) and specificity of 87% (33 of 38), but presence of exclusively noncalcified plaque was detected with only 53% sensitivity (8 of 15). If analysis was limited to the 41 proximal segments (segments 1, 5, 6, and 11 according to American Heart Association classification), sensitivity and specificity were 92% and 88% for any plaque, 95% and 91% for calcified plaque, and 91% and 89% for noncalcified plaque. MDCT substantially underestimated plaque volume per segment as compared with IVUS (24+/-35 mm3 versus 43+/-60 mm3, P<0.001). CONCLUSIONS: The results indicate the potential of MDCT to detect coronary atherosclerotic plaque in patients without significant coronary stenoses. However, further improvements in image quality will be necessary to achieve reliable assessment, especially of noncalcified plaque throughout the coronary tree.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=14691045

Am J Cardiol (2004);94:1590-3
Standard versus user-interactive assessment of significant coronary stenoses with multislice computed tomography coronary angiography
F. Cademartiri*, et al.*
Department of Radiology, Erasmus Medical Center, Rotterdam, The Netherlands.
filippocademartiri@hotmail.com
Forty-four patients in sinus rhythm with suspected coronary artery disease underwent 16-row multislice computed tomography coronary angiography and conventional coronary angiography. Two protocols for image analysis were applied to the multislice computed tomographic images: standard projections versus interactive postprocessing. The diagnostic accuracy of both methods for the detection of significant lesions (>50%

J Am Coll Cardiol (2004);43:831-9
Diagnostic accuracy of multidetector computed tomography coronary angiography in patients with angiographically proven coronary artery disease
A. Kuettner*, et al.*
Department of Diagnostic Radiology, Eberhard-Karls-University, Tuebingen, Germany.
axel.kuettner@med.uni-tubingen.de
OBJECTIVES: The aim of the present study was to evaluate the diagnostic accuracy in detecting high-grade coronary stenoses in patients with known coronary artery disease (CAD) using multidetector computed tomography (MDCT). BACKGROUND: The MDCT systems with electrocardiographic (ECG)-gating permit visualization of the coronary arteries. However, severe calcifications and higher heart rates are known to degrade image quality and limit correct diagnosis. METHODS: Sixty-six patients with proven CAD as assessed by conventional coronary angiography (CCA) were studied by MDCT (mean time 24 months postangiography). Total calcium score and all coronary arteries, including distal segments and side branches, were assessed with respect to evaluability, presence of high-grade coronary artery stenoses (>70%), and correct diagnosis. Results were compared to CCA. RESULTS: A total of 105 lesions were detected by CCA. The MDCT correctly detected 39 lesions (sensitivity 37%, specificity 99%). The correct clinical diagnosis could be obtained in 24 patients (36%). Artifacts due to elevated heart rates or severe coronary artery calcification were the main cause of degraded image quality inhibiting correct diagnosis. In 21/66 patients (32%) all four major coronary vessel segments could be visualized. A threshold for maximum heart rate and a maximum calcification level were established (65 beats/min and an Agatston Score Equivalent of 335, respectively). A second analysis was made using these thresholds. Of all patients studied, 10/11 (91%) were correctly diagnosed when adhering to these thresholds. CONCLUSIONS: When using MDCT as a noninvasive diagnostic modality to assess advanced CAD,

Mean calcium score was 506 +/- 743 Agatston score equivalent (ASE); 13 of 58 (22%) patients had an ASE >or=1,000, 46 of 58 (78%) patients <1,000. In 763 coronary segments, CCA detected a total of 75 lesions >or=50%. The MSCT correctly assessed 54 of these. Twenty-one lesions were missed or incorrectly underestimated. Sensitivity was 72%, specificity 97%. When restricting analysis to patients with an ASE <1,000, 40 significant lesions >or=50% were seen on CCA, and MSCT correctly detected 39 lesions (sensitivity 98%, specificity 98%). Regardless of any threshold, the correct clinical diagnosis could be obtained in 58 of 60 (97%) of all patients. CONCLUSIONS: In individuals with low-to-moderate amounts of coronary artery calcium, 16-detector CT coronary angiography has high sensitivity and specificity for the diagnosis of significant coronary artery stenosis.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15364324

J Am Coll Cardiol (2004);43:1241-7
Accuracy of multidetector spiral computed tomography in identifying and differentiating the composition of coronary atherosclerotic plaques: a comparative study with intracoronary ultrasound
A. W. Leber*, et al.*
Department of Cardiology, University of Munich, Munich, Germany.
aleber@helios.med.uni-muenchen.de
OBJECTIVES: We evaluated the accuracy of contrast-enhanced multidetector spiral computed tomography (MDCT) for the noninvasive detection and classification of coronary plaques and compared it with intracoronary ultrasound (ICUS).
BACKGROUND: Noninvasive determination of plaque composition and plaque burden may be important to improve risk stratification and to monitor progression of coronary atherosclerosis. METHODS: We included 46 consecutive patients with a distinctive risk profile, who were investigated by ICUS (Goldvision, 20 MHz, Jomed Inc., Rancho Cordova, California). Due to the inability to slow the heart rate below 65 beats/min (n = 7) and due to renal insufficiency (n = 2), nine of 46 consecutive patients could not be studied by MDCT (Sensation 16, Siemens, Forchheim, Germany). RESULTS: In the remaining 37 patients, 68 vessels were investigated by ICUS, and 58 of these vessels were visualized by MDCT with image quality sufficient for analysis. In these vessels that were divided in 3-mm sections, MDCT correctly classified 62 of 80 (78%) sections containing hypoechoic plaque areas, 87 of 112 (78%) sections containing hyperechoic plaque areas, and 150 of 158 (95%) sections containing calcified plaque tissue. In 484 of 525 (92%) sections, atherosclerotic lesions were correctly excluded. The MDCT-derived density measurements within coronary lesions revealed significantly different values for hypoechoic (49 HU [Hounsfield Units] +/- 22), hyperechoic (91 HU +/- 22), and calcified plaques (391 HU +/- 156), p < 0.02). Ud due0053 TwIgb[(rem5.5(d i0002 Ta.9ded a4C(l)5.9(c)-9.3(2)5.9(f)5.2ad62 plaques (391 HU +/- 156), p < 0.

Evaluation of venous and arterial conduit patency by 16-slice spiral computed tomography

E. Martuscelli*, et al.*
Department of Cardiology, Tor Vergata University, Rome, Italy. e.martuscelli@libero.it

BACKGROUND: Computed tomography has been shown to be useful in the evaluation of aortocoronary bypass grafts (CABG). This is the first prospective study to evaluate the accuracy of a new-generation scanner in the detection of patency and significant stenoses (>50% decrease in diameter) of venous and arterial grafts in patients with previous CABG. METHODS AND RESULTS: In 96 patients (80 males, mean age 62 years) with previous CABG, a multislice computed tomography (MSCT) scan was performed (collimation 16x0.625 mm). Patients with atrial fibrillation, renal failure, severe respiratory disease, severe heart failure, heart rate >70 bpm despite therapy, or unstable angina were excluded. A total of 285 conduits implanted on the native coronary arteries at the time of CABG were evaluated. MSCT data were analyzed by 2 independent radiologists and compared with the results of conventional angiography. Three patients were excluded from analysis. All conduits were judged evaluable in 84 patients. Among these patients, MSCT correctly diagnosed 54 occluded grafts and 4 significant stenoses on the body of the grafts. Of the 17 significant anastomotic lesions, MSCT correctly diagnosed 15. For these 84 patients, diagnostic accuracy was 99%, sensitivity was 97%, and specificity was 100%. When all 93 patients were considered, the sensitivity of MSCT in diagnosing significant stenoses was 96%. CONCLUSIONS: MSCT with the new-generation scanner allows for accurate assessment of venous and arterial conduits in patients with previous CABG with a high degree of sensitivity and specificity. Exclusion criteria and radiation exposure remain limitations of the method.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15533862

J Am Coll Cardiol (2004);43:2265-70
Multislice spiral computed tomography coronary angiography in patients with stable angina pectoris

N. R. Mollet*, et al.*
Department of Cardiology, Thoraxcenter, Erasmus Medical Center, Rotterdam, Netherlands.

OBJECTIVES: This study was designed to prospectively evaluate the diagnostic performance of multislice spiral computed tomography (MSCT) coronary angiography for the detection of significant lesions in all segments of the coronary tree potentially suitable for revascularization. BACKGROUND: Noninvasive MSCT coronary angiography is a promising coronary imaging technique. METHODS: Sixteen-row MSCT coronary angiography was performed in 128 patients (89% men, mean age 58.9 +/- 11.7 years) in sinus rhythm with stable angina pectoris scheduled for conventional coronary angiography. Sixty percent (77 of 128) of patients received pre-scan oral beta-blockers, resulting in a mean heart rate of 57.7 +/- 7.7 beats/min. The diagnostic performance of MSCT for detection of significant lesions (> or =50% diameter reduction) was compared with that of quantitative coronary angiography (QCA). RESULTS: The sensitivity of MSCT for detection of significant lesions was 92% (216 of 234, 95% confidence interval [CI]: 88 to 95). Specificity was 95% (1,092 of 1,150, 95% CI: 93 to 96), positive predictive value 79% (216 of 274, 95% CI: 73 to 88), and negative

predictive value 98% (1,092 of 1,110, 95% CI: 97 to 99). Two > or =50% lesions were missed because of motion artifacts and two because of severe coronary calcifications. The rest (78%, 14 of 18) were detected but incorrectly classified as <50% obstructions. All patients with and 86% (18 of 21) of patients without significant lesions on QCA were correctly classified by MSCT. All patients with significant left main disease or total occlusions were correctly identified on MSCT. CONCLUSIONS: Sixteen-row MSCT coronary angiography permits reliable detection of significant obstructive coronary artery disease in patients with stable angina in sinus rhythm.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15193691

Am J Cardiol (2005);95:240-3
Value of preprocedure multislice computed tomographic coronary angiography to predict the outcome of percutaneous recanalization of chronic total occlusions
N. R. Mollet*, et al.*
Department of Cardiology, Thoraxcenter, Erasmus Medical Center, PO Box 2040, 3000 CA Rotterdam, The Netherlands.
We performed multislice computed tomographic coronary angiography in 45 patients who had chronic total occlusions and were scheduled for percutaneous recanalization. Multivariate analysis identified a blunt stump (by conventional angiography), occlusion length >15 mm, and severe calcification (by multislice computed tomographic coronary angiography) as independent predictors of procedural failure.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15642558

Am J Cardiol (2004);94:1294-7
Comparison of measurement of cross-sectional coronary atherosclerotic plaque and vessel areas by 16-slice multidetector computed tomography versus intravascular ultrasound
F. Moselewski

computed tomography
T. Schlosser*, et al.*
Department of Diagnostic and Interventional Radiology, University Hospital, Essen, Germany.
OBJECTIVES: The aim of this study was to evaluate the diagnostic accuracy of a 16-detector row computed tomography (CT) scanner for the assessment of coronary artery bypass grafts. BACKGROUND: A new generation of multislice spiral CT scanners, equipped with more and thinner detector rows, allows for reliable noninvasive detection of obstructive coronary artery disease. METHODS: The study included 51 consecutive patients. Three patients had to be excluded from the study due to arrhythmias or fast heart rates despite beta-blockade. A total of 48 patients with 131 coronary artery bypass grafts (internal mammary artery, n = 40; venous grafts, n = 91) were examined by computed tomography angiography (CTA) and by invasive coronary angiography (ICA) using a 16-detector row CT scanner. For cardiac protocols, only the 12 inner detector rings are applied. All CT examinations were performed with retrospective electrocardiogram gating at a mean heart rate of 64 +/- 5 beats/min; 120 ml of Xenetix 300 (Guerbert GmbH, Sulzbach, Germany) were continuously injected. The bypass graft patency and the presence of stenoses as well as the proximal and distal anastomoses were evaluated by two experienced readers. RESULTS: All bypass grafts and 74% of the distal bypass anastomoses could be visualized by CTA; 21 bypass graft occlusions and 1 significant stenosis were detected by CTA and confirmed by ICA. Five false positive and one false negative finding resulted in a sensitivity of 96%, a specificity of 95%, a positive predictive value of 81%, and a negative predictive value of 99%. CONCLUSIONS: Sixteen-detector row CT scanner technology allows for the reliable visualization of coronary bypass grafts. Dysfunctional bypass grafts can be detected with high diagnostic accuracy. This technology can be used as a noninvasive test for patients with suspected graft dysfunction.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15364323

Am J Cardiol (2004);94:427-30
Feasibility of assessment of coronary stent patency using 16-slice computed tomography
J. D. Schuijf*, et al.*
Department of Cardiology, Leiden University Medical Center, Albinusdreef 2, 2333 ZA Leiden, The Netherlands.
Intracoronary stent implantation is a frequently performed procedure in the treatment of stenoses in coronary arteries, but in-stent restenosis occurs in approximately 10% to 15% of patients. A noninvasive diagnostic procedure to evaluate in-stent restenosis would therefore be of great benefit. We investigated the feasibility of assessing stent patency with 16-slice computed tomography. Multislice computed tomography (MSCT) was performed in 22 patients with previously implanted stents. For each stent, assessability was determined and related to stent type and diameter. Subsequently, the presence of significant restenosis was determined in the evaluable stents. In addition, peristent lumina (5 mm proximal and distal to the stent) were evaluated. Conventional angiography in combination with quantitative coronary angiography served as the standard of reference. MSCT was performed successfully in all but 1 patient. Of 65

stents, 50 (77%) were determined assessable. Uninterpretable stents tended to have a thicker strut and/or a smaller diameter. In the evaluable stents, 7 of 9 stenoses were detected and the absence of restenosis was correctly identified in all 41 patent stents, resulting in a sensitivity and specificity of 78% and 100%, respectively. Sensitivity and specificity for the detection of peristent stenosis were 75% and 96%, respectively. In conclusion, MSCT may be useful in the assessment of stent patency and may function as a gatekeeper before invasive diagnostic procedures.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=15325923

Circulation (2004);110:1467-72
In vivo 16-slice, multidetector-row computed tomography for the assessment of experimental atherosclerosis: comparison with magnetic resonance imaging and histopathology
J. F. Viles-Gonzalez*, et al.*
Cardiovascular Biology, Research Laboratory, Mount Sinai School of Medicine, New York, NY 10029, USA.
BACKGROUND: Noninvasive imaging can detect early atherosclerotic disease. Magnetic resonance imaging (MRI), because of its excellent spatial resolution, is already established as a tool for plaque characterization. Sixteen-slice, multidetector-row computed tomography (MDCT) was recently introduced into the field of cardiac imaging, with promising results for noninvasive angiography. We compared the capabilities of MDCT and MRI for the assessment of noncalcified, atherosclerotic plaques. METHODS AND RESULTS: Six atherosclerotic rabbits underwent in vivo imaging by MDCT and 1.5-T MRI. MDCT parameters were 120 kV, 120 mA/s, collimation 12x0.75, and spatial resolution 0.6x0.6 mm. MRI parameters were as follows: for proton density, repetition time/echo time (TR/TE) 2300/5.6; for T2, TR/TE 2300/62; and for T1, TR/TE 800/5.6; slice thickness was 3 mm and spatial resolution, 0.3x0.3 mm. Blinded analysis of 3-mm axial reconstructions from MDCT and the carefully matclt8tirculao2al 5(ers) b)-4.;110:TJ7-728(r T1, TR/TE)-5.1 Tc0.0003 Tw46L2.1(8-5.vivo 16