INCREMENTAL DIAGNOSTIC VALUE OF DYNAMIC CT-BASED MYOCARDIAL PERFUSION IMAGING FOR THE DETECTION OF HEMODYNAMIC RELEVANT CORONARY ARTERY STENOSIS AS DETERMINED BY FRACTIONAL FLOW RESERVE

ACC Oral Contributions
McCormick Place North, N426
Saturday, March 24, 2012, 8:45 a.m.-9:00 a.m.

Session Title: New Imaging Approaches to Atherosclerosis and the Microcirculation
Abstract Category: 24. Imaging: CT
Presentation Number: 909-6

Authors: Alexander Becker, Fabian Bamberg, Martin Greif, Franz von Ziegler, Christoph Becker, University of Munich, Munich, Germany

Background: We determined the diagnostic accuracy of CT-based myocardial perfusion imaging for the detection of hemodynamic relevant coronary artery stenosis by comparing CT perfusion imaging to the invasive measurement of fractional-flow reserve (FFR).

Methods: We examined patients with an indication for invasive angiography due to suspected coronary artery disease. The patients underwent dynamic stress (adenosine stress with 0.14 mg/kg/min) myocardial perfusion imaging (100 kV, 320 mAs/rot) at alternating table positions in ECG-triggered end-systolic timing using a Dual Source CT system. At invasive angiography, FFR measurement was performed in coronary arteries with luminal narrowing 40-75%. Myocardial blood flow (MBF) and volume (MBV) were derived from CT using a model-based parametric deconvolution method for each myocardial segment which was related to any coronary stenosis by an independent observer and was classified as hemodynamically relevant if FFR was below 0.75.

Results: We enrolled 55 subjects, 48 (63.3±10 years, 37 males) completed the study protocol (average radiation dose was 9.1±1.9 mSv). MBF and MBV were lower in myocardial segments pertaining to hemodynamic relevant coronary stenoses (78.7±26 vs. 122.7±34 ml/100 ml/min and 15.3±6 vs. 24.9±5 ml/100 ml/min, for MBF and MBV, respectively; p<0.001). A MBF cut-point of 75 ml/100 ml/min provided the highest discriminatory power (AUC: 0.711, p<0.001). While the diagnostic accuracy of CT for the detection of significant coronary artery stenosis was high (sensitivity: 95 %, specificity 97 %, PPV: 84 %, and NPV: 98 %) it was low for the detection of hemodynamically relevant coronary stenosis (PPV: 47%). When using the information on MBF to reclassify the lesions, 40 (46 %) coronary lesions were graded as not hemodynamically impaired, resulting in a significantly increased PPV of 78 %. The presence of a coronary stenosis with a corresponding MBF <75 ml/100 ml/min in CT was a strong predictor for a hemodynamic relevant stenosis, OR: 84.9, 95%-CI: 23.6 - 424.3).

Conclusion: Our data suggest that CT-based myocardial perfusion imaging allows the detection of hemodynamic relevant coronary artery stenoses with a high diagnostic accuracy.