Summary

Early identification of CAD is of paramount importance in patients with diabetes as these patients are at increased risk not only of developing CAD, but also, for its complications.

Visualization of the coronary arteries is preferred in diabetic patients than noninvasive testing to detect CAD, as these patients frequently have diffuse, multivessel CAD.

Currently, invasive coronary angiography is performed to evaluate the presence and extent of CAD. However, this is an invasive approach associated with minimal but definitive complications, and a noninvasive technique that is capable of direct visualization of coronary arteries and simultaneously assessing left ventricular function is preferred.

The current study was conducted to assess the accuracy of MSCT, as a noninvasive test, in detection of coronary anatomy and left ventricular function.

The study included 30 patients who were referred for invasive coronary angiography after having a MSCT coronary angiography. Patients with arrhythmia, renal impairment, known contrast allergy and previous coronary bypass grafting or coronary stents were excluded from the study.

All patients had the MSCT conducted using a 64-slice Toshiba CT scanner with 64X0.5 mm collimation. The study included a pre scan calcium scoring, followed by a contrast enhanced scan.

The contrast was injected intravenously using a dual head power injector. All patients received non-ionic, low-osmolar contrast. The bolus

tracking technique was used; the scan was automatically started when the contrast reached a peak concentration in the left side of the heart.

All scans were ECG gated. The ECG gating was used to retrospectively reconstruct the datasets at the mid to late diastolic phase of each cardiac cycle (75%). Reconstructions of phase images are performed throughout the whole cardiac cycle in 5% increasing steps, 20 heart phases being thus obtained that can be displayed as a loop in cine format for analysis of left ventricular volumes and function. Heart rate control was attempted in every patient using a beta blocker (atenolol) orally.

All patients had their invasive coronary angiographies done 30±days from the MSCT.

Echocardiography was done for all patients who were imaged in the left lateral decubitus position using a commercially available system.

Data from different techniques were analyzed by operators blinded to the results of the other tests.

MSCT data were evaluated using the transaxial images, as well as other reconstruction modalities; multiplanar reconstructions, MIP and curved MPR. A 15-segment coronary tree model was used. Each segment was evaluated both with MSCT and coronary angiography. By MSCT segments were labeled either with significant stenosis (≥50% luminal narrowing) or with no significant stenosis (< 50% luminal narrowing). Non evaluable coronary segment were also recorded. Using invasive coronary angiography each coronary segment was labeled either normal or atherosclerotic with the degree of luminal stenosis recorded. Visual analysis was used with both tests.

Left ventricular ejection fraction was calculated using semiautomated endocardial contour detection with manual correction when necessary. Papillary muscles were regarded as being part of the left ventricular cavity.

Regional wall motion was assessed visually using the short-axis slices (displayed in cine-loop format) by one observer blinded to all other data using the 17-segment model. Each segment was assigned a wall motion score using a four-point scale (1=normokinesia, 2=hypokinesia, 3=akinesia, and 4=dyskinesia).

Echocardiography evaluated regional wall motion using 17-segment model. Left ventricular ejection fraction was calculated from the two- and four-chamber images using the bi-plane Simpson's rule.

The current study revealed a very good diagnostic accuracy of the MSCT coronary angiography. Sensitivity, specificity, PPV, and NPV were 92%, 98%, 89%, and 98%, respectively. These values were reached when evaluating the MSCT results against invasive coronary angiography (per segment analysis). With inclusion of non-evaluable segments (5%), sensitivity and specificity were still 84 and 98%, respectively. Moreover, although inclusion of non-evaluable segments resulted in a positive predictive value of 66%, the negative predictive value remained high (96%).

The high accuracy of MSCT in the exclusion of CAD as demonstrated by the high specificity and negative predictive value in the current study underscores the potential of this technique to function as a first-line diagnostic modality in the workup of patients with suspected CAD.

The current study revealed that the sensitivity to detect significant coronary artery stenosis increased with the increase in stenosis severity on invasive coronary angiography. From all the scanning parameter, the scanning heart rate was the most important predictor of the diagnostic quality of the study.

In the assessment of left ventricular ejection fraction, a close correlation was observed between MSCT and two-dimensional echocardiography. Overall agreement of regional wall motion score was excellent; 92% of segments scored identically.

In conclusion, accurate noninvasive assessment of both the coronary arteries and left ventricular function with MSCT is feasible in patients with diabetes mellitus. This combined strategy may improve the noninvasive evaluation of CAD in particular patient group.