Noninvasive Detection of Coronary Artery Stenosis by Multislice Helical Computed Tomography

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Noninvasive detection of coronary artery stenosis with noninvasive imaging modalities (electron beam CT, MR angiography) has recently emerged. The use of helical CT in the visualization of epicardial coronary arteries is limited by cardiac motion artifacts due to long acquisition times and lack of an ECG trigger and is therefore reliable only in the determination of coronary graft patency. With the introduction of a novel CT technology using a 4-slice CT system with shorter acquisition times and retrospectively ECG-gated helical scanning (Somatom Plus4VZ, Siemens), these limitations have been overcome. The helical CT system uses a multislice technique (simultaneous acquisition of 4 axial slices) with 250-ms temporal resolution and retrospective ECG gating. The scan starts 25 seconds after the injection of 140 mL of nonionic contrast medium (Ultravist 300, Schering) via a peripheral vein during 1 breathhold (acquisition time, 28±4 seconds) with simultaneous registration of the ECG signal. Images of the entire heart and the coronary vessels are nearly motion-free. After the acquisition, all images are transferred to an external workstation, and the ECG signal is used to reconstruct the images at identical time points, 500 ms before the next R wave (retrospective ECG gating). For 3D reconstruction and visualization of the coronary arteries, volume rendering techniques are applied (Insight; NeoImagery).

Figure 1 represents the results of multislice CT angiography of a 77-year-old woman referred to our hospital for evaluation of atypical chest pain. Exercise testing could not be performed because of peripheral artery disease. In addition to some calcified plaque, a high-grade stenosis of the proximal part of the left anterior descending coronary artery (LAD) was detected. In Figure 2, an occlusion of the middle part of the right coronary artery (RCA) is evident. The results of noninvasive coronary angiography were confirmed by conventional angiography.
Figure 1. 3D rendering of left coronary artery shows, in addition to some calcified plaques (arrowheads), high-grade stenosis (arrow) in proximal part of LAD that could be confirmed with conventional angiography. Ao. indicates ascending aorta; T.p., pulmonary trunk.

Figure 2. 3D rendering of occlusion (arrow) within middle segment of RCA and extensive calcification (arrowheads).
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