Three-Dimensional Images of Coronary Arteries After Heart Transplantation Using Electron-Beam Computed Tomography Data With Volume Rendering

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A 57-year-old man received a heart transplant in 1989 and has had no evidence of rejection. He underwent both electron-beam computed tomography (EBCT; ImatronC-150XP, Imatron) and conventional coronary angiography as part of a post–heart transplant evaluation protocol. Conventional coronary angiograms revealed angiographically normal coronary arteries (Figure 1). EBCT images were performed at a thickness of 1.5 mm, with a 100-ms scan time and intravenous administration of contrast medium. Axial images revealed normal coronary arterial lumina. EBCT provided data on the vessel lumen filled with contrast medium, the vessel wall, and the surrounding soft tissue. Volume rendering showed the structure surrounding the lumen as well as the vessel lumen (Figure 2). Images obtained by volume rendering are highly dependent on the shape of the lumen, opacity, color curves, and the quality of the image sources. The partial volume effect may also influence 3D data processing. The development of the EBCT scanner and reconstruction technique capability may allow the creation of images by 3D volume-rendering using EBCT data to noninvasively evaluate relevant intimal thickening of the coronary arteries after transplantation.

References

Figure 1. Coronary angiogram taken in 30-degree left anterior oblique view. Angiogram was obtained with a left Judkins catheter and is normal.
Figure 2. A, 3D volume-rendering images using EBCT data. Left superior frontal view shows lumina of coronary arteries filled with contrast medium. Left main artery (LM), left anterior descending branch (LAD), left circumflex branch (LCx), right coronary artery (RCA), diagonal branch (Diag), and septal branch (Sep) can be identified. PA indicates pulmonary artery. B, Same view as in A showing surface of coronary vessel wall. Surface of vessel wall is thicker than lumen (A). We eliminated visualization of contrast medium from lumen to show inside of lumen and represented structure surrounding coronary arterial lumen, which appears in cut-away views (on right) to represent vessel walls. Cut-plane volume rendering displays show a longitudinal image of left main artery and Aorta (Ao; top), transverse image of left main artery and longitudinal image of left circumflex artery (second from top), transverse image of left anterior descending artery (second from bottom), and longitudinal image of left anterior descending artery and septal branch (bottom).
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