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IMAGES IN INTERVENTION

Comprehensive Imaging of Coronary Stent Using Ultra-High Resolution Spectral Photon Counting CT

A Multimodality Validation

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The recent clinical introduction of ultra-high-resolution spectral photon-counting computed tomography (SPCCT) has opened new frontiers in coronary stent imaging.[1,2] A 66-year-old man known for previous left anterior descending coronary artery (LAD) stent implantation was admitted to the emergency department of our institution with suspected non-ST-segment elevation acute coronary syndrome. Invasive coronary angiography (ICA) including optical coherence tomography demonstrated a 60% intrastent restenosis in the proximal LAD, which was due to a focal suboptimal stent expansion (**Figures 1A and 1B**). Diffuse intrastent neointimal hyperplasia and a mid-LAD gap between 2 stents were also identified. The initial treatment was conservative with medical therapy for 1 month, but repeat ICA showed no evolution of the stenosis. As the fractional flow reserve assessment was negative for significant hemodynamic stenosis, with 2 measurements of 0.87 and 0.86, no intervention was planned. As part of our research protocol, 2 coronary computed tomographic angiographic examinations were performed 1 day prior to repeat ICA, using a clinically available computed tomographic scanner (CT 7500, Philips Healthcare; 0.625-mm^3 resolution) and a clinical research prototype spectral photon-counting computed tomographic scanner in ultra-high-resolution mode (Philips Healthcare; 0.25-mm^3 resolution). Although both systems identified the 60% intrastent stenosis in the proximal LAD, SPCCT enabled better stent structure characterization, with improved visualization of the focal suboptimal stent expansion that was due to compressive coronary calcifications (**Figures 1E and 1H**), as well as better characterization of the diffuse neointimal hyperplasia and the mid-LAD stent gap, which was initially missed on conventional computed tomography (**Figures 1F and 1I**).

SPCCT has the potential to allow a comprehensive noninvasive imaging assessment of coronary stents, whereas conventional computed tomography struggles because of lesser spatial resolution and significant metallic artifacts limiting image quality.

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

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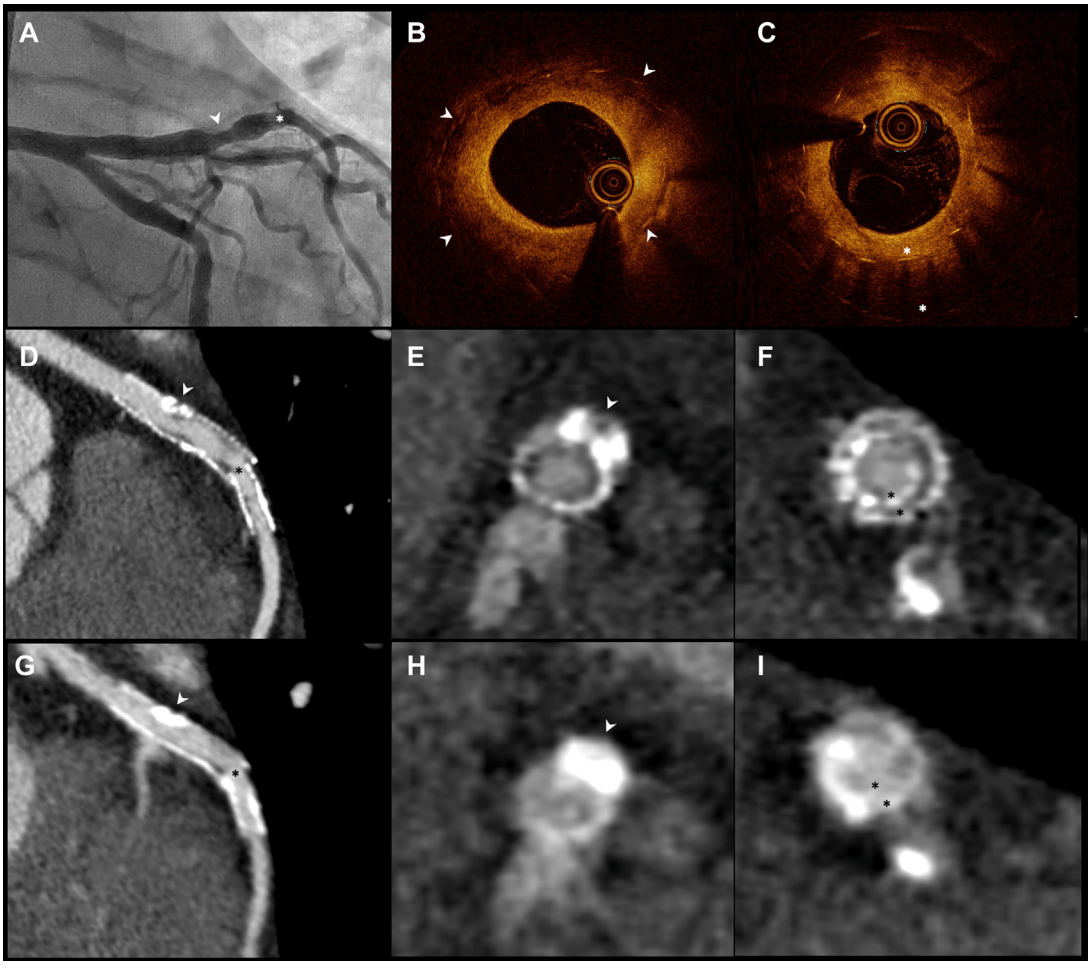
FIGURE 1 Comprehensive Imaging of Coronary Stent and its Complications Using Ultra-High Resolution Spectral Photon-Counting CT



Right anterior oblique invasive coronary angiography (ICA) (A), optical coherence tomography (OCT) (B, C), spectral photon-counting computed tomography (SPCCT) (D to F), and conventional computed tomography (CT) (G to I) of the proximal and mid-LAD. The 60% proximal intrastent restenosis due to a focal suboptimal stent expansion (arrowheads in A and B) detected on ICA and OCT was explained by a compressive external calcification (arrowheads in D, E, G, and H) that was best characterized on SPCCT. The distal stent gap (asterisks) was initially missed on conventional CT but was visible on SPCCT. Note the diffuse intrastent neointimal hyperplasia that is also better visible with SPCCT.

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