Imaging Comparisons of Coregistered Native and Stented Coronary Segments by High-Definition 60-MHz Intravascular Ultrasound and Optical Coherence Tomography

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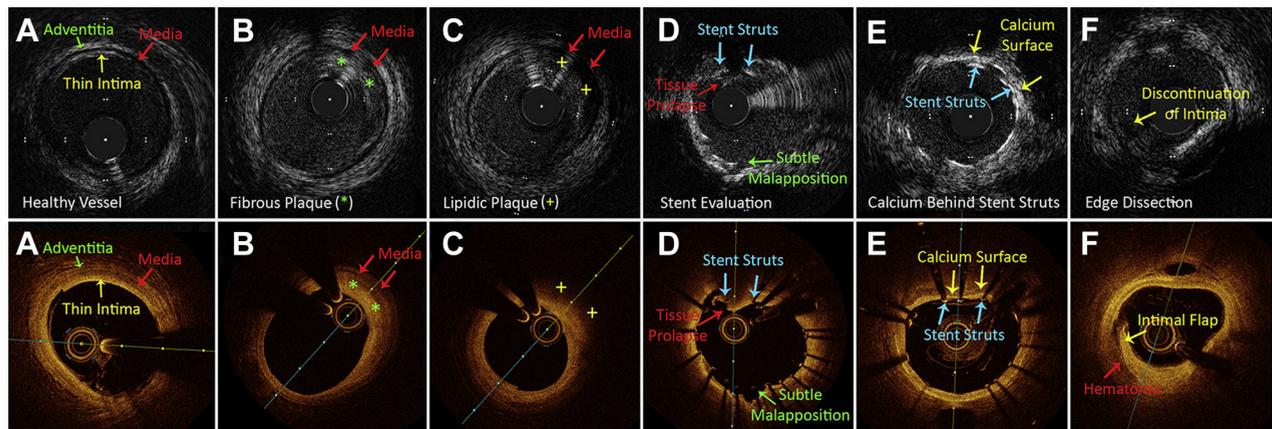
High-definition 60-MHz intravascular ultrasound (IVUS) represents the current state of the art in IVUS imaging, offering superior spatial resolution of <100 μm, faster catheter pull-back speeds up to 10 mm/s, and rapid image acquisition at 60 frames/sec, compared with conventional 40-MHz IVUS. High-definition IVUS maintains the potential benefits of IVUS over optical coherence tomography, namely, greater tissue penetration without the need for luminal blood clearance. Here, we compare selected coregistered slices of typical in vivo native and stented coronary vessel segments in real-world patients who were imaged by both high-definition IVUS using the Kodama catheter (ACIST Medical Systems, Eden Prairie, Minnesota) and optical coherence tomography

using the Optis catheter (St. Jude Medical, St. Paul, Minnesota).

High-resolution imaging allows clear definition of healthy vessel layers (Figure 1A). In most cases, the superior tissue penetration of IVUS permits full vessel evaluation through fibrous (Figure 1B) and lipidic (Figure 1C) plaque, whereas optical coherence tomographic signals are strongly attenuated by lipid. Post-stenting appearances enable the assessment of tissue prolapse and subtle malapposition (Figure 1D) and the delineation of stent struts from underlying structures including calcium (Figure 1E). Side lobe artifacts from stent struts are more pronounced on IVUS (Figures 1D and 1E), and optical coherence tomography remains superior in the assessment of luminal structures, including intimal dissection (Figure 1F).

FIGURE 1 Coregistered High-Definition Intravascular Ultrasound and Optical Coherence Tomographic Images of Native and Stented Coronary Segments

High-definition (HD) intravascular ultrasound (IVUS) images are displayed in the **upper panels**, and optical coherence tomographic images are displayed the **lower panels**. The intimal, medial, and adventitial layers within a healthy coronary segment are seen crisply by both HD IVUS and optical coherence tomography (OCT) **(A)**. Imaging slices separated 3 mm apart within the same coronary vessel illustrate the differences in fibrous **(B)** and lipidic **(C)** plaque as seen by both modalities. Post-stenting, appearances of tissue prolapse, subtle stent malapposition, and calcium underlying stent struts are shown **(D, E)**. A distal edge dissection is seen clearly on OCT, appearing on HD IVUS imaging as a discontinuation of the intimal layer without an obvious flap or hematoma **(F)**.

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