

Three-Dimensional Optical Coherence Tomography for Guidance of Complex Percutaneous Coronary Interventions

Jurgen M. R. Ligthart, RT, Roberto Diletti, MD, Karen Witberg, RN, Carl Schultz, MD, PhD

Rotterdam, the Netherlands

A 74-year-old man presented with stable angina and a positive stress test 5 months after a percutaneous coronary intervention (PCI). The index PCI

involved stenting of the proximal left anterior descending coronary artery (LAD) across a diagonal branch (D1) followed by stenting of the

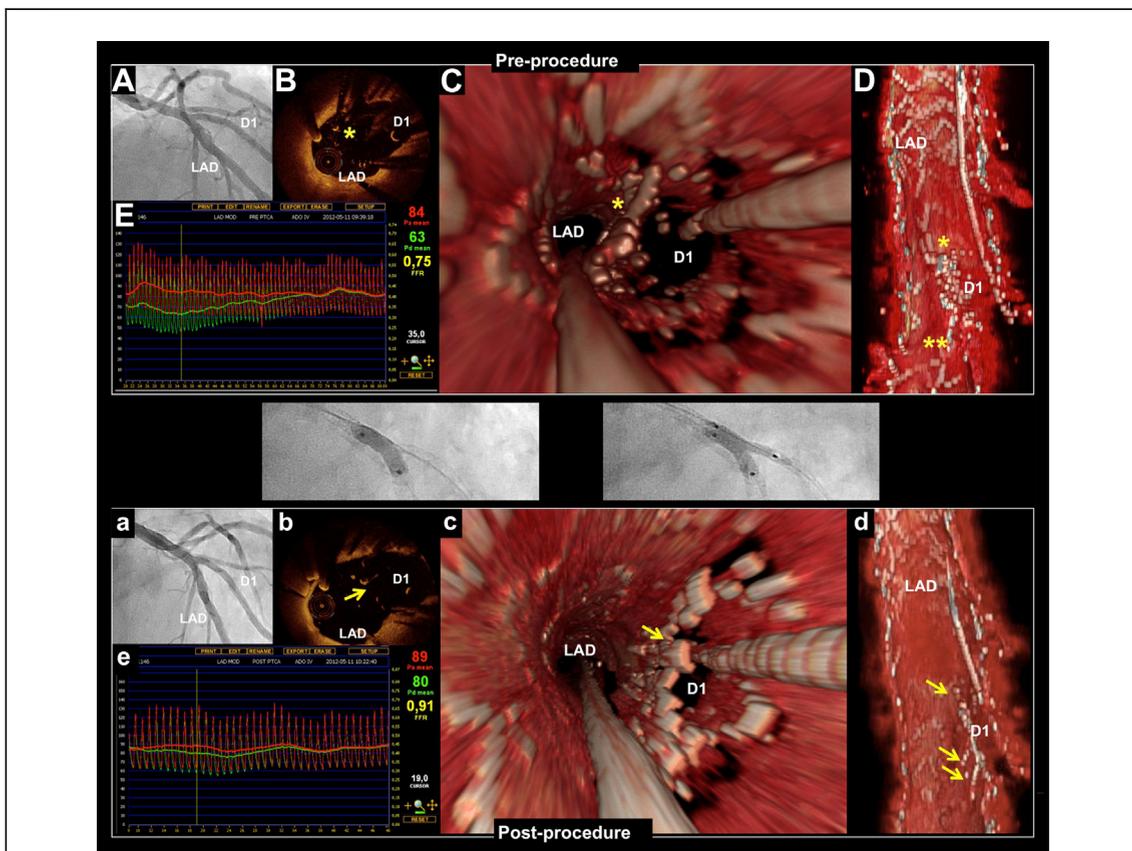


Figure 1. Angiographic, Optical Coherence Tomography (OCT) and 3-Dimensional OCT Appearance of the Treated Vessel

Pre- (upper panel) and post- (lower panel) intervention (mid panel). Although the angiographic images remained substantially unchanged there was a remarkable improvement (normalization) of the fractional flow reserve measurements after optimization of the stents geometry.

From the Thoraxcenter, Erasmus Medical Center, Rotterdam, the Netherlands. The authors have reported that they have no relationships relevant to the contents of this paper to disclose. The first 2 authors contributed equally to this work.

Manuscript received March 17, 2013; revised manuscript received April 26, 2013, accepted May 9, 2013.

diagonal, resulting in strut protrusion into the LAD, with the T-stenting and small protrusion technique (strut protrusion into the main branch) without further main-branch balloon or kissing balloon, but with a good angiographic result.

Repeat angiography showed no coronary stenoses (Fig. 1A). At pressure wire pullback, a significant drop in the fractional flow reserve (0.75) occurred at the level of the LAD bifurcation (Fig. 1E). Optical coherence tomography (OCT) showed the abnormal presence of stent struts in the LAD lumen (Fig. 1B, asterisk). To further clarify the morphology of the 2 stents and the strut distribution at the bifurcation site, a 3-dimensional (3D) OCT reconstruction was performed (1). The 3D OCT showed the side-branch stent protruding into the LAD (Fig. 1C, asterisk) and distortion of the LAD stent just distal to the bifurcation, resulting in a reduced minimal luminal area of 3.6 mm² (normal >4.0 mm²) (Fig. 1D, double asterisks).

Sequential balloon dilations followed by simultaneous kissing balloons in both branches normalized the fractional flow reserve (0.91) (Fig. 1e). The 3D OCT showed an improved geometry with fewer protruding struts (Fig. 1c, single arrow) and resolution of stent deformation distal to the side branch (Fig. 1d, double arrow).

Stent strut protrusion and distortion of the main branch stent are recognized risks following a stent or balloon inflation

of the side branch. The angiographic appearance may be deceptively reassuring, and kissing balloons should be recommended as a final step. The 3D OCT facilitates understanding of the anatomy/stent geometry, and informs on the subsequent optimization of the bifurcation treatment strategy.

Reprint requests and correspondence: Dr. Roberto Diletti, Interventional Cardiology Department, Ee218, Thoraxcenter, Erasmus Medical Center, Gravendijkwal 230, 3015CE, Rotterdam, the Netherlands. E-mail: r.diletti@erasmusmc.nl or roberto-diletti@libero.it.

REFERENCE

1. Diletti R, Farooq V, Muramatsu T, et al. Serial 2- and 3-dimensional visualization of side branch jailing after metallic stent implantation: to kiss or not to kiss...? *J Am Coll Cardiol Intv* 2012;5:1089–90.

Key Words: 3-dimensional optical coherence tomography ■ complex PCI ■ coronary angiography.