JACC: CARDIOVASCULAR INTERVENTIONS VOL. 6, NO. 5, 2013

ISSN 1936-8798/$36.00
PUBLISHED BY ELSEVIER INC. http://dx.doi.org/10.1016/j.jcin.2012.11.018

Unfurling the Coronary

A Novel "Flyover" 3-Dimensional Optical Coherence Tomography Reconstruction Method

James Doherty, BE,* Harry C. Lowe, MBChB, PhD†‡

Sydney, Australia

Optical coherence tomography (OCT) (C7 OCT, DragonFly catheter, LightLab, St. Jude, Minneapolis, Minnesota) was performed at 20 mm/s pullback immediately after stenting (3.0 × 12 mm Promus, Boston Scientific, Natick, Massachusetts) to a proximal left anterior descending coronary lesion.

Automated post-procedure reprocessing of the coronary OCT image sequence was achieved with a novel algorithm designed to unfurl the endoluminal surface, allowing rendering as a flat plane. In brief, this required approximation of the artery center by calculation of the centroid of each 2-dimensional image; transformation of each of these centered images from Cartesian to polar data, and finally shifting the position of the guidewire shadow to the image border, with MATLAB software (Mathworks, Natick, Massachusetts). Images were then stacked sequentially with OsiriX image processing software (Pixemo Software, Geneva, Switzerland). This reconstruction formed a user-manipulable 3-dimensional (3D) view of the endoluminal surface rendered as a flat plate (Fig. 1A, Online Video 1). The image processing time was 240 s.

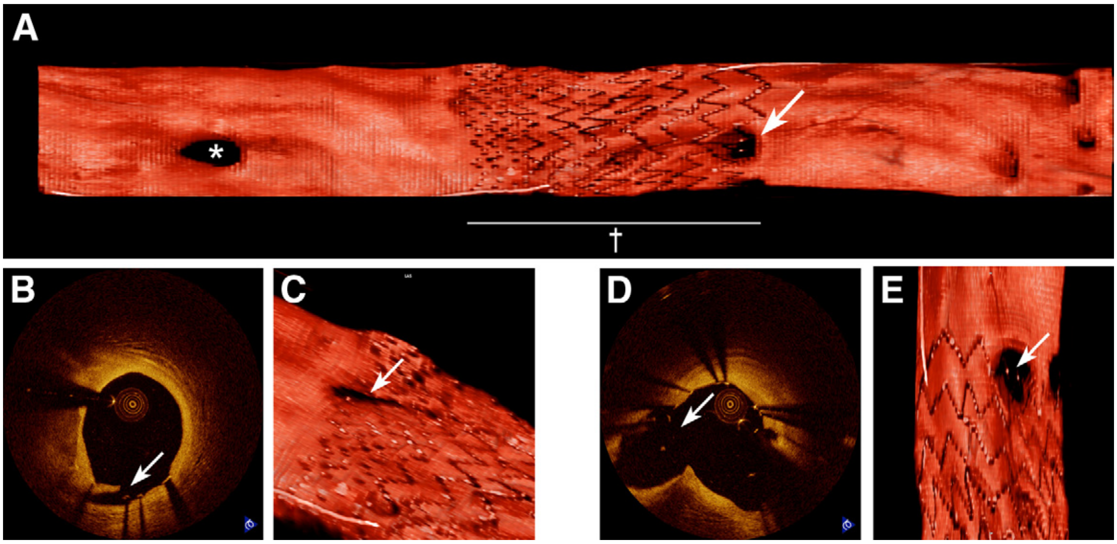

Figure 1. "Flyover" view of the endoluminal surface over the entire interrogated segment, showing side branch ostia marked *

(A) PROMUS 3 × 12.0 mm Everolimus-Eluting Coronary Stent marked †, with an arrow marking the ostia of a jailed side branch. **(B)** 2D-OCT image of proximal edge in-stent dissection **(C)**. 3D reconstruction of vessel adjacent to proximal in-stent edge dissection, (arrow) **(D)**. 2D-OCT image of stent strut position over side branch ostium **(E)**. 3D-OCT reconstruction of vessel adjacent stent struts over jailed side branch ostium.

*From the Medical School, University of Sydney, Sydney, Australia; †Anzac Research Institute, University of Sydney, Sydney, Australia; and the ‡Cardiology Department, Concord Repatriation General Hospital, Sydney, Australia. The authors have reported that they have no relationships relevant to the contents of this paper to disclose.

Manuscript received October 23, 2012; accepted November 21, 2012.

This technique allows visualization of the entire endoluminal surface (Fig. 1A) and morphology of interest, such as stented length, jailed side branches (Figs. 1D and 1E), and proximal edge in-stent dissection (Figs. 1B and 1C). Recently proposed OCT 3D reconstruction techniques are providing increasingly clinically useful information, principally presented data as a "Flythrough" format (1). The technique presented here provides a distinct, novel "Flyover" presentation of the entire coronary artery at a glance. Although image quality will be improved with slower OCT catheter pullback speeds, the rapid processing time—and the lack of any commercially available 3D OCT software at present—means this technique warrants further evaluation.

Reprint requests and correspondence: Dr. Harry C. Lowe, Cardiology Department, Concord Repatriation General Hospital, Hospital Road, Concord, Sydney, NSW 2139 Australia. E-mail: h.lowe@bigpond.net.au.

REFERENCE

1. Lowe HC, Narula J, Fujimoto JG, Jang I-K. Intracoronary optical diagnostics: current status, limitations and potential J Am Coll Cardiol Intv 2011;4:1257–70.

Key Words: coronary ■ optical coherence tomography ■ stent.

APPENDIX

For accompanying videos, please see the online version of this article.