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Optical Coherence Tomography of a Bifurcation Lesion Treated With Bioresorbable Vascular Scaffolds With the "Mini-Crush" Technique

Charis Costopoulos, MD,*†‡ Toru Naganuma, MD,*† Azeem Latib, MD,*† Antonio Colombo, MD*†

Milan, Italy; and London, United Kingdom

A 51-year-old man was referred for coronary angiography following a positive scintigraphy test for anterior and anterolateral ischemia. Angiography showed a chronic total occlusion of the mid-left anterior descending coronary artery (LAD) and stenosis of the ostial first diagonal branch (Fig. 1). The total occlusion of the LAD was crossed, and rotablation was performed. A 2.5 × 28-mm Absorb bioresorbable vascular scaffold (BVS) stent (Abbott Vascular, Santa Clara, California) was implanted in the LAD just distal to the first diagonal. A second 2.5 × 18-mm Absorb was implanted in the first diagonal branch. Optical coherence tomography (OCT) imaging demonstrated that

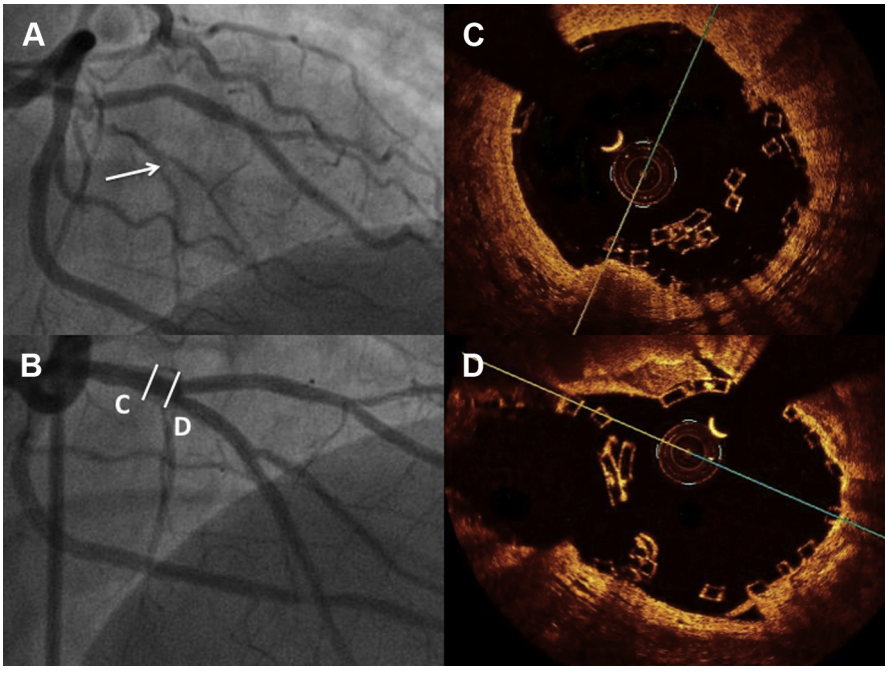

Figure 1. Angiographic and OCT Images Following BVS Implantation in the LAD and D1 Before Post-Dilation and FKBI

(A) Anterior-posterior (AP) cranial view of left coronary artery demonstrating an occluded left anterior descending coronary artery (LAD) at the level of the second diagonal branch (D2) **(arrow). (B)** AP cranial view of angiographic result following implantation of 2 bioresorbable vascular scaffold (BVS) stents in the LAD and a BVS stent in the first diagonal branch (D1). The **lines labeled C and D** indicate the locations of the optical coherence tomography (OCT) images in **C and D**, respectively. **(C)** OCT image proximal to the LAD/D1 bifurcation demonstrating inadequate "crush" of protruded D1 BVS by the LAD BVS (scaffold area = 6.25 mm^2). **(D)** OCT image demonstrating the "jailed" D1 ostium by the BVS struts. FKBI = final kissing balloon inflation.

From the *Interventional Cardiology Unit, San Raffaele Scientific Institute, Milan, Italy; †Interventional Cardiology Unit, EMO-GVM Centro Cuore Columbus, Milan, Italy; and ‡Interventional Cardiology Unit, Imperial College London, London, United Kingdom. Dr. Latib serves on the Medtronic advisory board. All other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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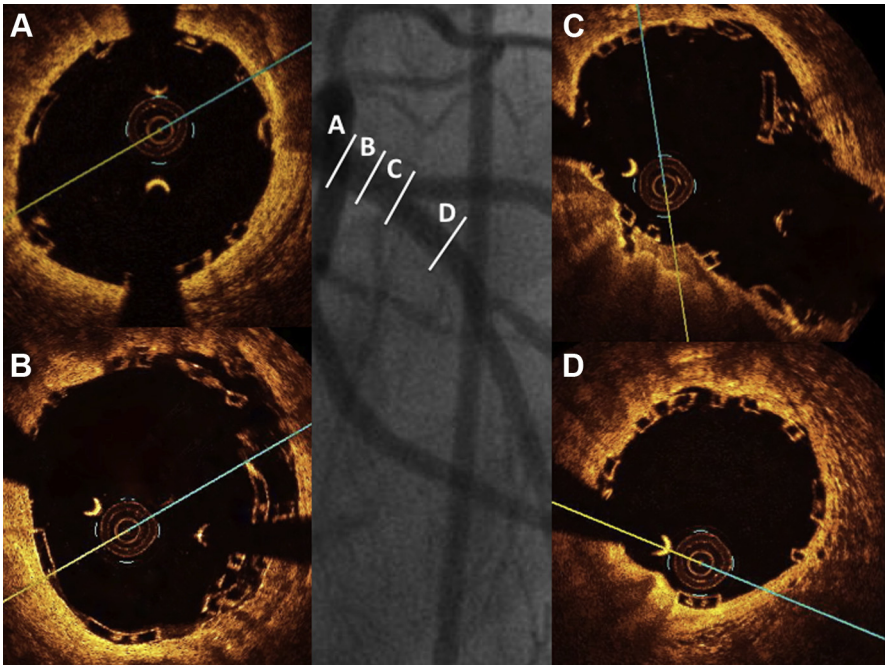

Figure 2. Angiographic and OCT Images of the Final Result

The **middle panel** shows the AP cranial view of the final result. The **lines labeled A, B, C, and D** indicate the locations of the OCT images in **A to D**, respectively. **(A)** OCT image of the proximal LAD demonstrating a well-opposed and adequately expanded BVS (scaffold area = 8.62 mm^2). **(B)** OCT image proximal to the LAD/D1 bifurcation demonstrating improved "crush" of protruded D1 BVS with an increased LAD lumen area (scaffold area = 7.63 mm^2). **(C)** OCT image at the LAD/D1 bifurcation demonstrating the D1 ostium "free" from BVS struts. **(D)** OCT image distal to the LAD/D1 bifurcation demonstrating a well-opposed and adequately expanded BVS (scaffold area = 6.25 mm^2). Abbreviations as in Figure 1.

the BVS implanted on the diagonal was protruding into the LAD by approximately 4 mm. This protrusion was crushed onto the LAD with a balloon inflation, and a third 3.0 × 28-mm Absorb stent was implanted in the LAD, straddling the origin of the diagonal. Subsequent OCT demonstrated inadequate "crush" of the diagonal scaffold struts. Following high-pressure post-dilation in both branches and final kissing balloon inflation, acceptable BVS apposition was achieved (Fig. 2).

Concerns regarding the use of BVS stents in bifurcation lesions exist due to their large strut thickness, which may result in a thick scaffold segment when a systematic 2-stent strategy is utilized (1). The OCT images presented here indicate that this concern may be valid, but the final result can be acceptable by selecting large vessels, ideally >3.0 mm in diameter. Intravascular imaging and meticulous post-dilation will help ensure good apposition of crushed struts to the vessel wall. This will reduce the risk of early restenosis and stent thrombosis, whereas the eventual resorption of the scaffold may also prevent both of these in the future.

Reprint requests and correspondence: Dr. Antonio Colombo, EMO-GVM Centro Cuore Columbus, 48 Via M. Buonarroti, 20145 Milan, Italy. E-mail: info@emocolumbus.it.

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Key Words: bioresorbable vascular scaffolds ■ coronary bifurcation ■ optical coherence tomography.