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IMAGES IN INTERVENTION

Longitudinal Elongation, Axial Compression, and Effects on Strut Geometry of Bioresorbable Vascular Scaffolds

Insights From 2- and 3-Dimensional Optical Coherence Tomography Imaging

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Recently described, metallic drug-eluting stent longitudinal distortion is a mechanical phenomenon that leads to stent compression and strut separation ("pseudofracture") during percutaneous coronary intervention (1). Conversely, bioresorbable vascular scaffolds (BVS; Absorb, Abbott Vascular, Santa Clara, California) implantation may be associated with scaffold elongation (i.e., longitudinal stretching), but the mechanisms associated with this phenomenon are still not completely elucidated (2). Herein, we report 2 representative cases that further refine the description of its mechanisms.

Two patients underwent uneventful implantation of BVS because of unstable angina. Optical coherence tomography (OCT) (Ilumien, St. Jude Medical, Saint Paul, Minnesota) assessments were performed after BVS deployment. None of the cases underwent balloon post-dilation. One patient in whom a 3.0 × 18-mm BVS was implanted at 16 atm revealed a BVS length by OCT of 20.6 mm (14.4% longer than predicted by nominal length); in addition, this patient demonstrated reduced thickness of BVS struts (mean strut thickness 131 ± 7 μm) (**Figure 1**). Conversely, the other patient had a 3.5 × 18-mm BVS implanted at 10 atm, and no elongation compared with the predicted length was revealed by OCT evaluation (i.e., OCT measured length 18 mm); furthermore, the thickness of the struts was larger compared with the elongated scaffold (mean strut thickness 154 ± 2 μm, similar to the value provided by the manufacturer of 156 μm) (**Figure 1**).

Although elongation occurred without compromising scaffold strut integrity in this early experience (i.e., neither disruption nor fracture were revealed), we hypothesized that BVS longitudinal stretching could be associated with a reduction in scaffold strut thickness, as well as with alteration in the scaffold cell conformation, as herewith demonstrated by high-resolution intravascular imaging. Although we acknowledge that the clinical impact of elongation and alteration in scaffold cell conformation deserves further investigation, we speculate that it might affect the following scenarios during BVS implantation: 1) bifurcations (i.e., impairment of side branch access); 2) ostial lesions (i.e., protruding the scaffold into the left main coronary artery or in the aorta

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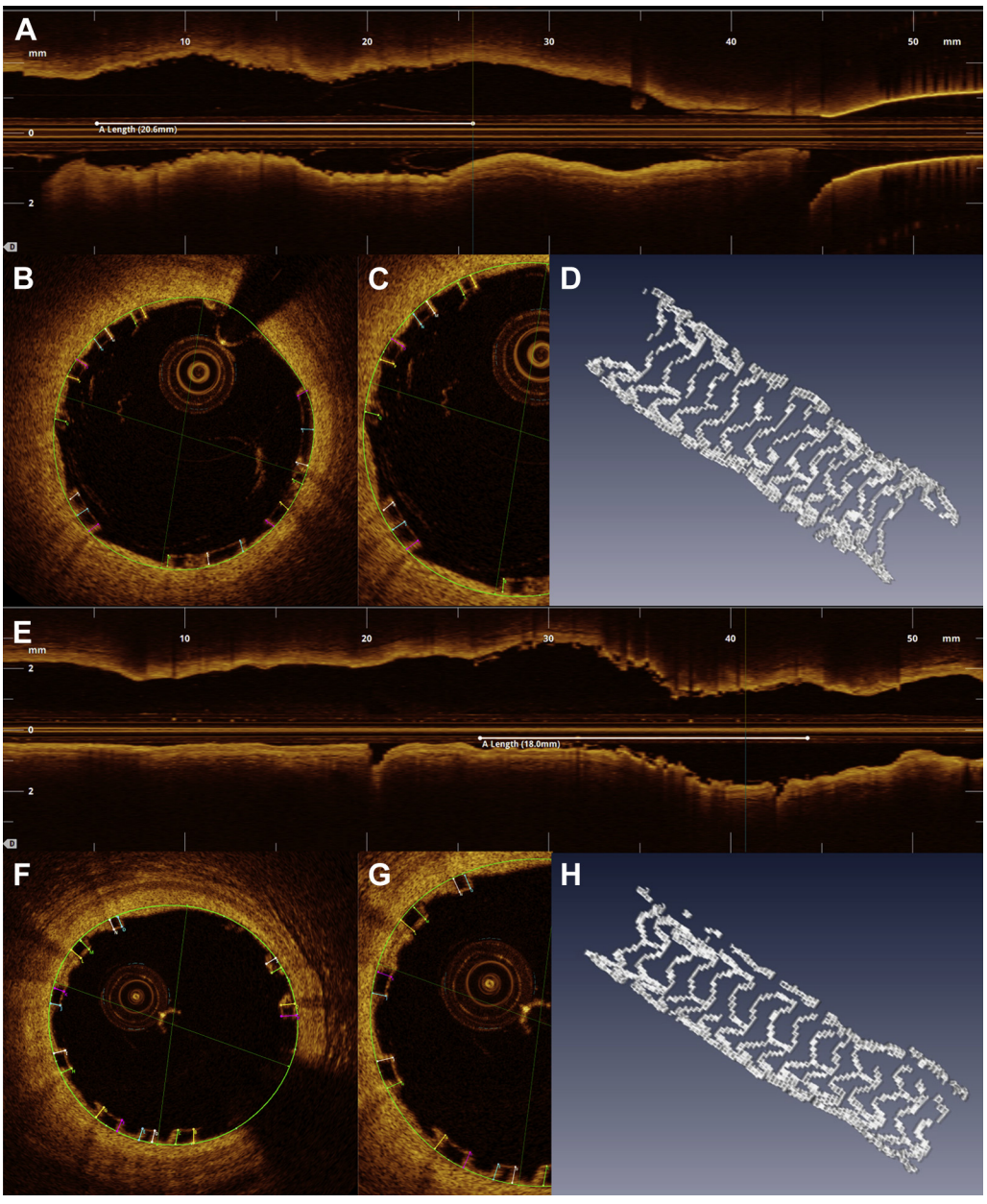
FIGURE 1 2- and 3-D OCT Imaging of Elongated and Nonelongated BVS



In **A**, one can depict the elongated (compared with nominal length) scaffold, whereas axial compression (mean strut thickness 131 ± 7 μm) of the struts compared with the nonelongated scaffold is revealed in **B** and **C**. Notably, 3-dimensional (3-D) reconstruction **(D)** demonstrates alteration in scaffold cell conformation compared with the 3-D reconstruction of nonelongated scaffold **(H)**. The nonelongated scaffold is demonstrated in **E**, whereas **F** and **G** show noncompressed struts (i.e., mean strut thickness 154 ± 2 μm). OCT = optical coherence tomography.

without intention to do so); 3) overlapping (i.e., performing longer overlapping than expected); and 4) eventually leading to longitudinal geographic miss (i.e., landing the scaffold in a diseased region distal or proximal to the target landing zone).

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