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LETTER TO THE EDITOR

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Impact of post-dilatation on strut apposition of second-generation bioresorbable vascular scaffolds: Key role for scaffold thrombosis and prognosis?

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A 54-year-old patient, with known history of type 1 diabetes mellitus and hypercholesterolemia had been referred to the documented center due to subacute non-ST segment elevation myocardial infarction. Coronary angiography revealed a high-grade unstable and calcified lesion in the middle portion of the right coronary artery considered as a culprit lesion (Fig. 1A). The lesion preparation was achieved using a 2.5 × 15 mm compliant balloon inflated up to 14 atmospheres (atm), then a 3.0 × 15 mm non-compliant balloon inflated up to 18 atm (3.12 mm); subsequently, a second-generation everolimus-eluting bioresorbable vascular scaffold (BVS, ABSORB™ 3.0 × 18 mm, Abbott Vascular, Santa Clara CA, USA) was deployed progressively up to 11 atm (3.24 mm). Optical frequency-domain imaging (OFDI, Ilumien Optis System from St. Jude Medical, Inc. St. Paul, MN, USA) were utilized to assess the strut apposition inapparent in coronary angiography (Fig. 1B–D). Overall, 183 cross-sections were evaluated during three OFDI-pullbacks (n = 1615 struts). Struts were malapposed when the distance of the adluminal strut reflection from the vessel wall exceeded half of the nominal strut thickness (75 out of 150 μm). Strut malapposition of 13.02% (n = 74/560) was documented directly after BVS implantation (Fig. 1B, E), 8.70% (n = 46/529) after several post-dilatations with a 3.0 × 12 mm non-compliant balloon inflated up to 24 atm (3.20 mm) (Fig. 1C, F) and 6.10% (n = 32/525) after an additional two post-dilatations with a 3.5 × 15 mm non-compliant balloon inflated up to 14 atm (3.54 mm) (Fig. 1D, G).

This example case illustrates some important procedural techniques for optimal implantation of a BVS. A 1:1 balloon:vessel pre-dilatation was achieved (3.12 mm for a 3.0 mm BVS). Post-dilatation with a non-compliant balloon was performed afterwards and inflated 0.5 mm over the nominal diameter of the scaffold. Since BVS implant is radiolucent, additional intracoronary imaging modalities i.e. OFDI are valuable to guide optimal BVS-strut apposition [1–3], which was very well demonstrated in this case, especially that post-dilatation strategies were oriented based on struts malapposition observed on OFDI consecutive pullbacks. It was observed that strut apposition significantly improved after further post-dilatations with higher pressure balloons (13.02%, 8.70% to 6.10% progressively). At 30-days follow-up, the patient evolution was smooth and free of cardiovascular event.

The in-scaffold thrombosis is a major concern following BVS-implantation [4]. The impact of stent apposition and strut characteristics on the neointimal healing process and subsequent stent thrombosis are clearly demonstrated [5]. The importance of pre and post-dilatation in optimizing scaffold implantation and expansion should not be underestimated, particularly in the case of complex lesions

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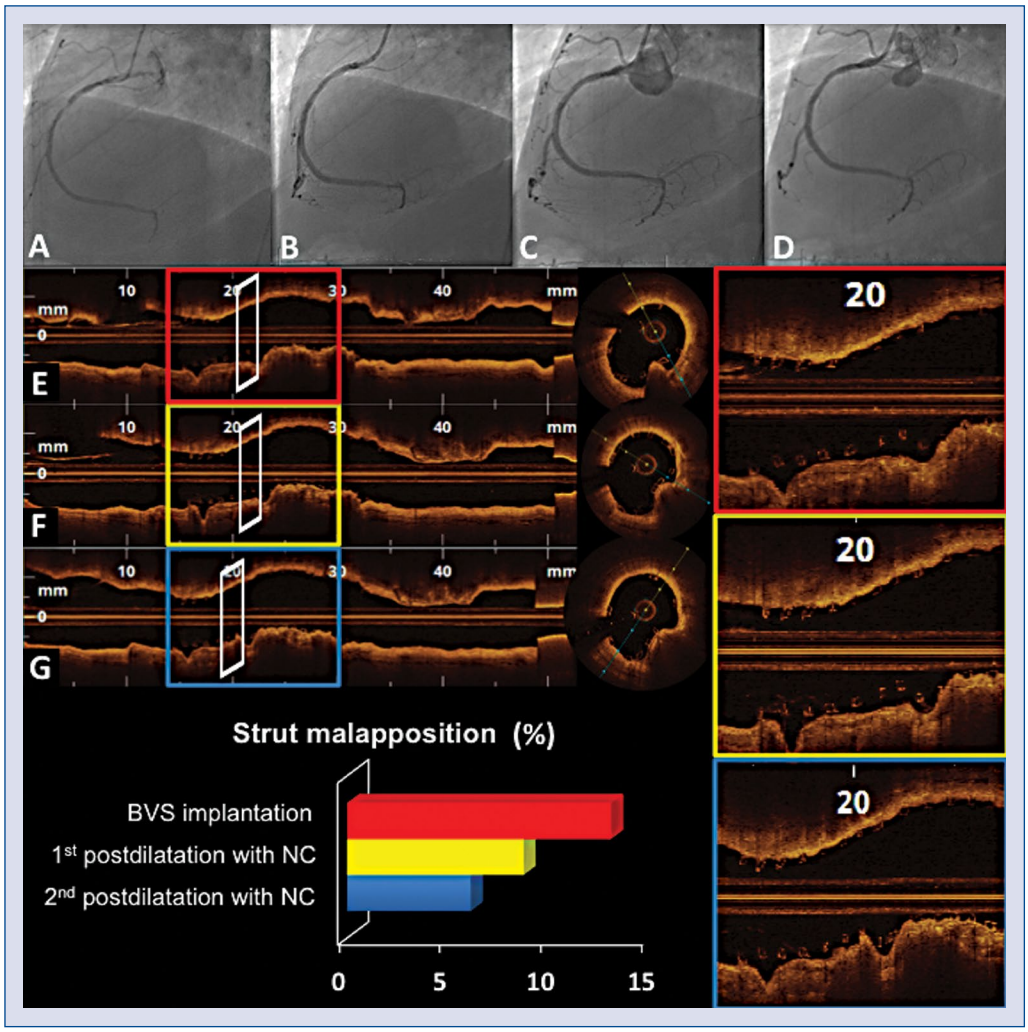

Figure 1. Serial right coronary artery angiography images **(A–D)** and correspondent optical frequency-domain imaging consecutive pullbacks **(E–G)**. Panel **A** shows the culprit lesion of the right coronary artery. Panels **B**, **E** and the red squares show the results after bioresorbable vascular scaffold (BVS) implantation with 13.02% of strut malapposition. Panels **C**, **F** and the yellow squares show the results after the first postdilatation with a 3.0 × 12 mm non-compliant balloon with 8.70% of strut malapposition. Panels **D**, **G** and the blue squares show the final result after additional postdilatation with a 3.5 × 15 mm non-compliant balloon with 6.1% of residual strut malapposition; NC — non-compliant balloon.

(i.e. bifurcations, long lesions, calcified plaques and acute coronary syndromes) [6] where BVS underexpansion, and malapposition are considered main pathomechanisms for both sub-acute or late thrombotic events [7, 8]. Additionally, post-dilatation after a BVS implantation seems to be beneficial even for soft lesions [9, 10]. On the other hand, it should be emphasized that balloon post-dilatation could result in BVS edge dissection or de-novo stenosis in case of "geographical miss" when the balloon markers are outside the scaffold markers during post-dilatation. Moreover, overexpansion of the scaffold could be also harmful and may result in strut fracture [11] or vessel perforation.

When reviewing the previous publications on BVS, we observe a fluctuation of post-dilatation rate, going from only 14% of cases in some series [12] to more than 60% [4, 13] and even up to 90% in other series [14].

Concerns about in-stent thrombosis exist and meticulous procedural techniques application i.e. pre and postdilatation as well as imaging guided percutaneous coronary intervention to optimize struts apposition may be beneficial in order to diminish this risk. Further studies are needed to better clarify this issue.

Conflict of interest: None declared

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