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IVUS-guided coronary intravascular lithotripsy to treat a severely under-expanded stent due to heavy underlying calcification. To re-stent or not?

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Coronary Intravascular Lithotripsy (IVL) offers a novel option for lesion preparation of severely calcified lesions in native coronary arteries pre-stenting [1]. Until now, undilatable lesions in previous stented segments have been courageously approached with debulking devices such as cutting or scoring balloons and atherectomy, with increased risk of procedural complications [1, 2]. The circumferential sonic waves of the IVL have the advantage to extend beyond strut layers and fracture deeper calcium deposits [1]. Some reports have supported the use of this technology for optimizing stent expansion without complications [3-5]. However, its efficacy in segments with multiple layers of stents has not been demonstrated and its impact on stent backbone/polymer integrity and drug-elution is still unknown. We present our initial experience with this technology in this demanding clinical scenario.

A 53-year-old male, with a history of type 2 diabetes mellitus, underwent a primary percutaneous coronary intervention (PCI) because of an inferior ST-elevation myocardial infarction (STEMI). Four zotarolimus eluting Resolute Integrity (Medtronic) stents, 2.75x30mm, 3.0x34mm, 4.0x15mm and 4.0x12mm were implanted in his dominant right coronary artery (RCA). Despite post-dilatation with a non-compliant Apollo NC (Brosmed) 4.0x10 mm balloon at high atm, full expansion of the distal stent could not be achieved because of 360° ring of calcification (Figure 1: panels 1, 2). Another significant lesion in the mid left anterior descending (LAD) artery was not treated in the index procedure. After a month, through transradial access and a 6 Fr AL 1 SH guiding catheter, the RCA intravascular ultrasound (IVUS) confirmed an underexpanded stent with heavy circumferential calcification and IVL treatment was decided (Figure 1: panel 3, Supplementary Figure S1: panels 3, a, b, c). A total of eight 10 sec-cycles were applied via a 4.0x12 mm shockwave-specific balloon (Shockwave Medical Inc) (Figure 1: panel 4). Repeated IVUS showed calcium disruption and a non-compliant Apollo NC (Brosmed) 4.0x10 mm balloon at 20 atm sufficiently expanded the stent (Figure 1: panels 5, 6, Supplementary Figure S1: panels 5, a’, b’, c’). No new stent-
in-stent implantation was deemed necessary. Finally, PCI of the LAD lesion with a 3.0x22 mm Resolute Integrity (Medtronic) stent completed the procedure. The patient was discharged the next day after an uneventful hospitalization.

IVL has appeared as a promising and effective technique for treating undilatable lesions in previous stented segments without complications. Only scarce reports exist about its use. Should a new stent-in-stent be implanted or not? Unanswered questions that accumulating experience will face up with time.
**Figure 1**

1. RCA angiogram during the inferior STEMI.


3. Residual in-stent stenosis of the RCA at the beginning of the second procedure.

4. In-stent S-IVL balloon during the second procedure.

5. In-stent post-dilatation after S-IVL with complete expansion of the non-compliant balloon.

6. Final result of the second procedure with no residual RCA in-stent stenosis.
References


