Intravascular imaging to guide lithotripsy in concentric and eccentric calcific coronary lesions

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Background: Calcified coronary lesions still represent a challenge for coronary angioplasty, with sub-optimal acute PCI results causing more frequent late stent failure.
Purpose: The study aimed at the evaluation of the immediate procedural outcome of a novel treatment algorithm based on IVUS and/or OCT and including lithotripsy into a real-world consecutive based on intravascular imaging assessment by IVUS or OCT.
Methods and results: Thirty-one calcified stenoses (28 patients) out of a total of 455 lesions in 370 patients treated between November 2018 and May 2019 met the clinical and angiographic criteria for treatment with IVL under intravascular imaging guidance. Patients were divided into two subgroups depending on the calcium arc measured with intravascular imaging. Twenty lesions showed a calcium arc greater than 180 degrees (289±53 degrees) and 11 lesions smaller than 180 (140±24 degrees). The following parameters were assessed with OCT and/or IVUS: post stent minimal lumen area (MLA) and area stenosis (AS), incomplete strut apposition (ISA), eccentricity index, strut fracture, and edge dissection. After optimization a satisfactory lumen enlargement (acute gain 1.28±0.46 mm; minimal stent area 7.09±2.77 mm^2) was observed with good stent expansion (residual area stenosis $<$20% in 29 lesions, 93.5%) and OCT calcium fractures in 71% of cases. Peri-procedural complications were limited to one dissection at the distal edge requiring an additional stent and 3 peri-procedural myocardial infarctions. There were no in-hospital coronary perforations, no pericardial effusions, no stent failure or thrombosis, no deaths.
Conclusions: A standardized algorithm applying multimodality imaging to guide selection and application of IVL facilitated second generation DES implantation with final post-dilatation delivers excellent immediate procedural results and patient outcome, both in concentric or eccentric calcifications.

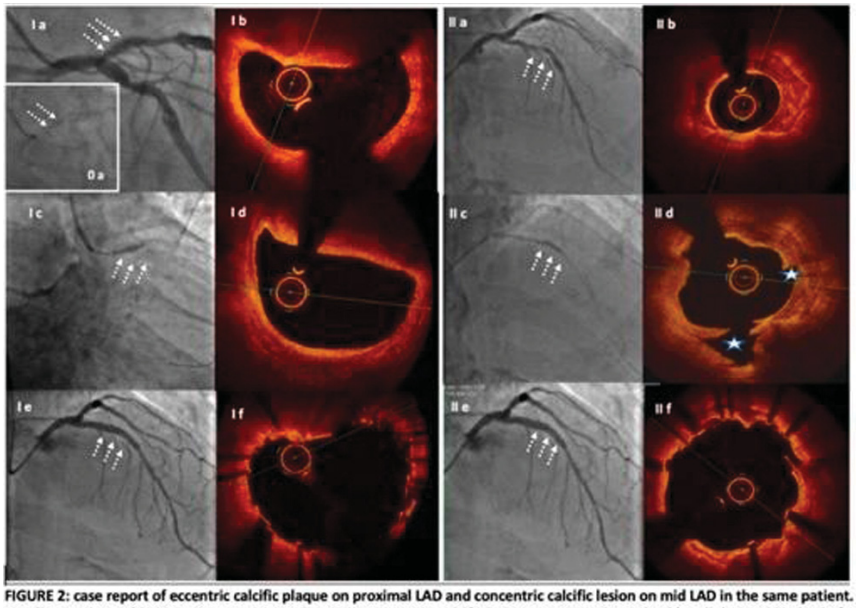

FIGURE 2: case report of eccentric calcific plaque on proximal LAD and concentric calcific lesion on mid LAD in the same patient. **Baseline angiographic** and **OCT assessment** showing an eccentric calcific lesion on proximal LAD (I a-b) well detectable also before contrast injection (0 a) and a concentric calcific plaque (arc > 270° with calcium thickness 0.90 mm) on mid LAD (II a-b).
Assessment after IVL: There are no cracks detectable after lithotripsy in the proximal LAD presenting an eccentric fibrocalcific nodule (I c-d), whereas in the mid LAD OCT analysis reveals deep calcium fractures with lumen enlargement visible into the thickness of the concentric calcific sheet (II d asterisks).
Angiographic and OCT final assessment after stent implantation: OCT showing good stent expansion but with eccentric shape after stent optimization at the site of fibrocalcific nodule (I e-f) whereas an excellent symmetric stent expansion with no stent malapposition and circular shape is appreciated at the site of concentric calcific plaque. (II e- f)