

## INTRAVASCULAR LITHOTRIPSY FOR TREATMENT OF SEVERELY CALCIFIED CORONARY ARTERY DISEASE IN ACUTE CORONARY SYNDROME

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### ABSTRACT:

*Percutaneous Coronary Intervention (PCI) in markedly calcified vessels is a challenge for Cardiologists involved in doing intervention of calcified arteries. Shockwave intravascular lithotripsy, a new device for modification of calcified plaque, may be used in such lesions. This case report is regarding a patient with NSTEMI and heavily calcified left anterior descending artery as culprit vessel. This calcified lesion could not be dilated with semi-compliant or non-compliant balloons at high pressures. Therefore, it was decided to use a newer modality like shockwave intra vascular lithotripsy balloon followed by stenting with drug-eluting stents and post-dilatation with non-compliant high pressure balloon. The final angiographic result was adequate which was confirmed with IVUS.*

### KEY WORDS:

Coronary Artery Calcification (CAC), Shockwave Intravascular Lithotripsy (S-IVL), Intravascular Ultrasound (IVUS), Acute Coronary Syndrome (ACS)

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### CASE:

A 64-years gentleman with hypertension, hyperlipidaemia with previous history of smoking and family history of coronary artery disease came to hospital with typical chest pain. His ECG was insignificant for ST-T changes but Hs-Troponin was raised to more than 1000units. So

a diagnosis of NSTEMI was made. He was shifted to cath lab for coronary angiogram through right radial approach which revealed calcified lesion in mid LAD (Fig 3: a,b) and severe ostial disease of R-PDA (for symptoms guided treatment). In view of angiographic anatomy, it was planned to do percutaneous coronary intervention of calcified

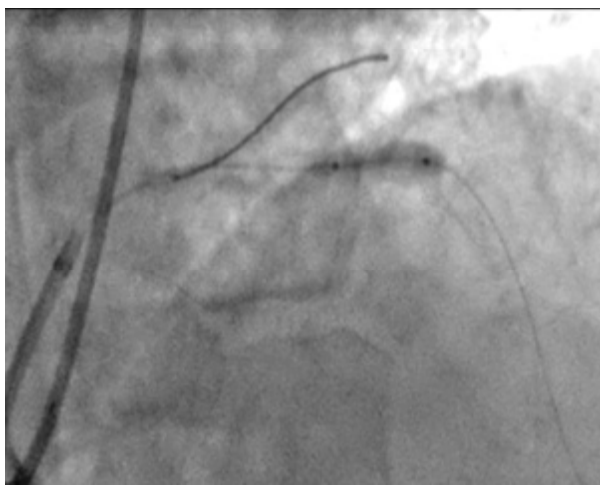


Fig-1a: Underexpanded NC Balloon

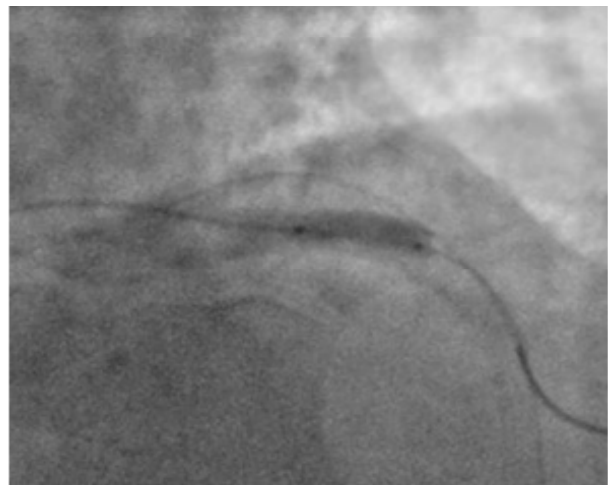


Fig-1b: Expanded Shockwave balloon

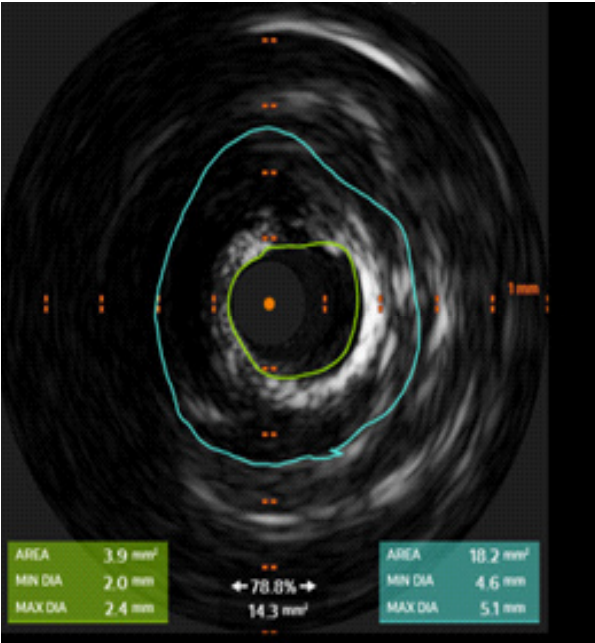


Fig-2a: Circumferential Calcium

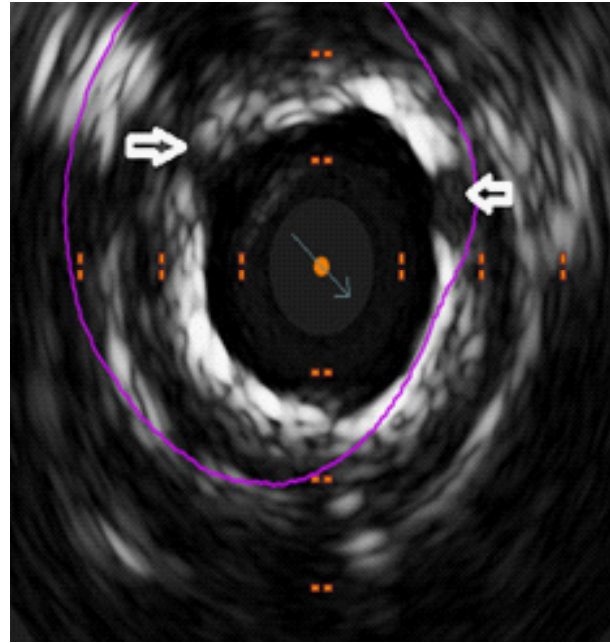


Fig-2b: Microfractures at 2 & 11 O'clock after IVL and initial gain in lumen size (Magnified Pic)

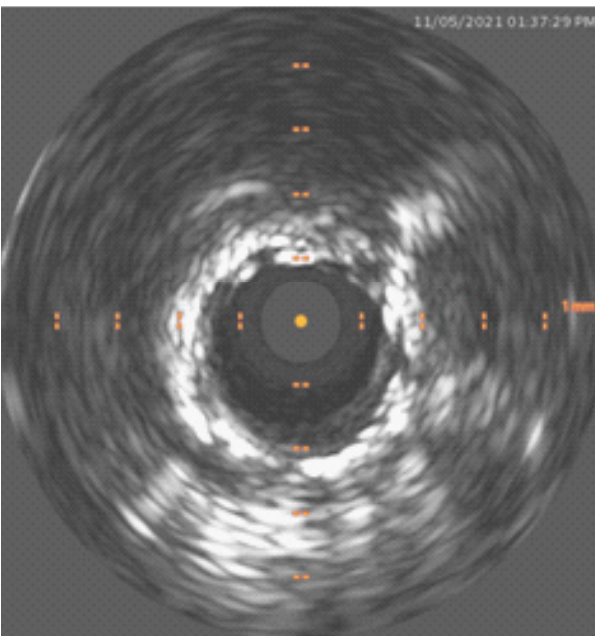


Fig-2c: Well Expanded Stent

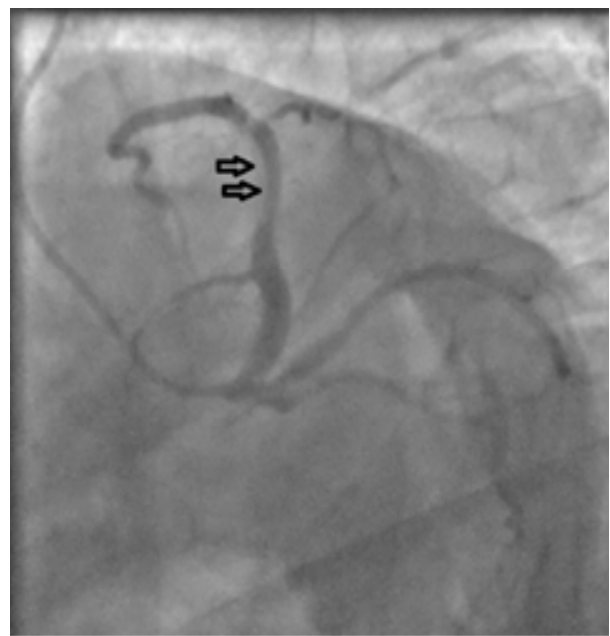


Fig-3a: Calcifications shown by arrows in Mid LAD

mid LAD lesion. A 6Fr EBU 3.5 was used as guiding catheter and a Sion blue guide-wire was placed into the distal left anterior descending artery. Multiple attempts were made to pre-dilate the lesion with semi-compliant or non-compliant balloons at high pressures but all the attempts were unsuccessful (Fig:1a). IVUS images revealed

circumferential calcification with 70-80% stenosis (Fig:2a). A 3.0 x 12 mm S-IVL balloon (shockwave intra vascular lithotripsy balloon) was used; with 8 cycles of lithotripsy delivered throughout the entire diseased segment at 6 atm (Fig:1b). IVUS run demonstrated micro-fractures in treated segments with gain in vessel lumen (Fig:2b). Further

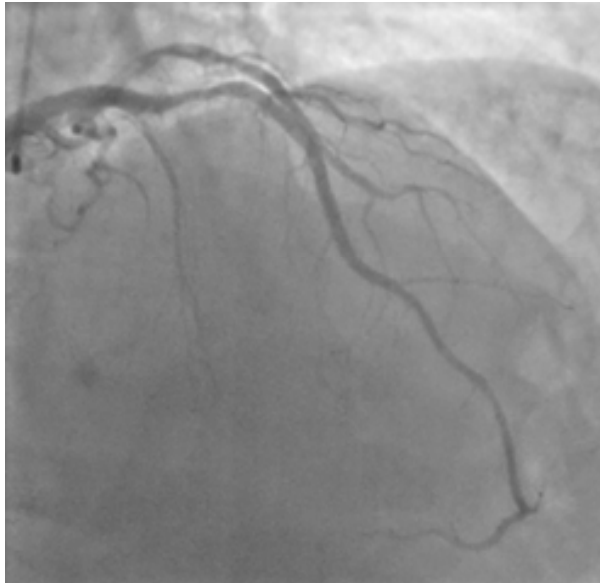


Fig-3a: Disease in mid LAD

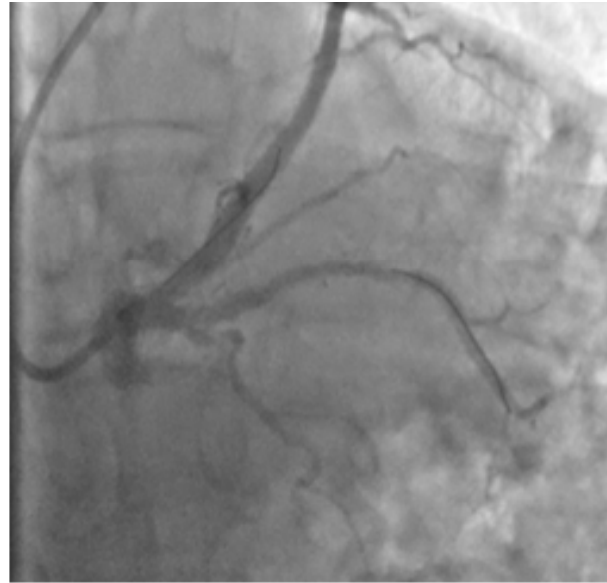


Fig-3a: Final results

pre-dilatation was performed with a 3.5x20 mm Scoring cutting balloon at 12 atm. A 3.5x30mm everolimus eluting stent DES was deployed at 14 atm in distal diseased segment followed by 4.0 x 12mm DES in proximal segment at 14 atm. Stented segments were post dilated with 3.75x 20 mm and 4.0x15 mm NC balloons at high pressures of 18 atm. Final IVUS run showed good apposition and expansion of stents with good angiographic results (Fig: 2,3c).

#### DISCUSSION:

Coronary artery calcification (CAC) complicates percutaneous coronary intervention (PCI) by device crossing failure, delamination of drug and polymer from stents, alteration of elution kinetics and drug delivery, and impairment of stent apposition and expansion.<sup>1</sup> High-pressure non-compliant balloon dilation, specialty balloons (scoring, cutting, ultra-high pressure), and atherectomy devices are techniques commonly used to facilitate PCI in severe calcified coronary artery lesions (CAC); however, all carry significant limitations. Non-compliant balloon dilation at high pressures may produce inadequate dilatations. In the presence of eccentric calcium, balloon dilation may be biased toward non-calcified segments of the artery, leading to dissection at the fibrocalcific interface rather than modification of calcium per se. Specialty balloons, including scoring, cutting, and ultra-high pressure balloons, may be subject to the same limitations as non-compliant balloons.<sup>2</sup> Rotational and orbital atherectomy devices, while highly effective for facilitating lesion crossing, peri-

procedural complications including slow-flow, peri-procedural myocardial infarction (MI), complex dissection, and perforation are also known to be significantly higher with atherectomy compared with balloon-based therapies.<sup>3</sup> Intravascular lithotripsy (IVL) is a novel technique based on an established treatment strategy for renal calculi, in which emitters located on catheter delivers multiple ultrasonic waves to modify the calcified plaques. Disrupt CAD I study (Disrupt Coronary Artery Disease), has shown the feasibility of IVL to modify calcified coronary plaques in circumferential way.<sup>4</sup> Disrupt CAD II study, evaluated the safety and effectiveness of IVL for vessel preparation of severe CAC in stenotic de novo coronary lesions before stent implantation and utilized optical coherence tomography (OCT) to examine its mechanism of action and effectiveness. This trial reported that shockwave intra vascular lithotripsy balloon may be a safe option in stable or unstable angina.<sup>5</sup>

#### CONCLUSION:

In the setting of acute coronary syndrome, shockwave intra vascular lithotripsy balloon is an easy and appropriate safe modality for calcified plaque modification of coronary arteries. For interventional cardiologists, it is a user friendly device and no special training is required.

#### DISCLAIMER:

Abstract has not been previously presented or published in a conference.

#### CONFLICT OF INTEREST:

None

#### FUNDING SOURCE TO DISCLOSE:

None

**References:**

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