CHALLENGING CALCIUM MADE SHOCKINGLY EASY

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ABSTRACT
Coronary artery calcification (CAC) hinders percutaneous coronary intervention (PCI) by impairment of device crossing, delamination of drug and polymer from stents, alteration of elution kinetics and drug delivery, and impairment of stent apposition and expansion. 70-year-old gentleman from Mangalore, a retired businessman by occupation was brought with complaints of Sudden onset chest discomfort which subsided on taking Sorbitrate.

Keywords: Coronary artery calcification, percutaneous coronary intervention, Intravascular lithotripsy

1. INTRODUCTION

Coronary artery calcification (CAC) hinders percutaneous coronary intervention (PCI) by impairment of device crossing, delamination of drug and polymer from stents, alteration of elution kinetics and drug delivery, and impairment of stent apposition and expansion. High-pressure noncompliant balloon dilation, specialty balloons (scoring, cutting, ultra-high pressure), and atherectomy are techniques commonly used to facilitate PCI in severe CAC; however, all suffer from significant limitations.[1]
Intravascular lithotripsy (IVL) is a novel approach to lesion preparation of severely calcified plaques in coronary and peripheral vessels. Lithotripsy is delivered by vaporising fluid to create an expanding bubble that generates sonic pressure waves that interact with arterial calcification[2].

CASE REPORT

70-year-old gentleman from Mangalore, a retired businessman by occupation was brought with complaints of Sudden onset chest discomfort which subsided on taking Sorbitrate.
Patient was a known case of Systemic Hypertension since 10 years, Ischemic heart disease since 10 years (S/P PTCA and Stenting to LCx and RCA) on Dual Antiplatelets for the same. He is also a known case of Atrial fibrillation with Controlled Ventricular rate (AF with CVR). He was also a heavy smoker with smoking exposure of 2 pack-years
He was taken up for Coronary Angiography (CAG)
Since he was anaemic, 3 units of Packed Red blood cells (PRBCs) were transfused.
His enzymes were found to be normal and ECG revealed AF with CVR.
His coronary angiogram revealed findings as mentioned below
LMCA: Normal
LAD: Proximal 80% calcified lesion, mid 80% calcified lesion
LCx: Mid LCx to proximal OM2 patent stent
RCA: Dominant, proximal 40% lesion, mid patent stent
LV Angiogram: Not done
(LMCA- Left Main Coronary Artery; LAD- Left Anterior Descending Artery; LCx- Left Circumflex Artery; RCA- Right coronary Artery; OM2- Second Obtuse Marginal)
(PTCA- Percutaneous Transluminal Coronary Angioplasty)
IMPRESSION: SINGLE VESSEL DISEASE
Procedure
INTRAVASCULAR ULTRASOUND + INTRAVASCULAR SHOCK WAVE LITHOTRIPSY + PTCA STENT TO LAD
Procedural details
- LMCA hooked with 6F XB 3.0 Cordis guiding catheter
- Lesion crossed with BMW guidewire
- IVUS done with 45mHz catheter

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- Predilatation done with 2.5 x 12mm NC Sapphire balloon
- Intravascular Shock Wave Lithotripsy done with 3 x 12mm balloon catheter for 80 cycles at 4 atmospheres
- Yukon Choice Flex 3 x 24mm stent deployed distally at 12 atmospheres
- Another Yukon Choice Flex Choice stent 3.5 x 28mm deployed proximally at 12 atmospheres
- Post dilated with 3.5 x 10mm NC Sapphire balloon at 14 atmospheres
- Good end result

2. DISCUSSION

The presence of moderate or severe lesion calcification increases procedural complications and impairs the long-term prognosis after PCI. Stent expansion in heavily calcified lesions may be facilitated by a variety of adjunctive lesion modification technologies which work by different mechanisms of action. Specifically, calcium fracture by balloon angioplasty, cutting or scoring balloon, atherectomy devices, ELCA, or IVL markedly improves stent expansion.[3]

Because of increasing age and comorbidities, prevalence of patients with severely calcified lesions is constantly increasing. Studies have shown that the severity of calcification significantly affects survival, myocardial infarction rates, and target lesion revascularization. This is due to the fact that calcified lesions are often circular, resistant, non-distensible, and therefore difficult to dilate by conventional angioplasty. Lesion preparation with high-pressure dilatation, use of scoring/cutting balloons, or rotational atherectomy (RA) devices before stent implantation have been strongly recommended. However, the above-mentioned strategies are often complicated by vessel dissection, perforation, and vessel occlusion[1]. Available data indicate that IVL leads to increased vessel compliance before stent implantation with high efficacy and an excellent safety profile.[2]

3. REFERENCES

1. Ali ZA, Nef H, Escaned J, Werner N, Banning AP, Hill JM, De Bruyne B, Montorfano M, Lefevre T, Stone GW, Crowley A, Matsumura M, Maehara A, Lansky AJ, Fajadet J, Di Mario C. Safety and Effectiveness of Coronary Intravascular Lithotripsy for Treatment of Severely Calcified Coronary Stenoses: The Disrupt CAD II Study. Circ Cardiovasc Interv. 2019 Oct;12(10):e008434.
2. Honton B, Monsegu J. Best Practice in Intravascular Lithotripsy. Interv Cardiol. 2022 Jan 28;17:e02.
3. Karimi Galougahi K, Shlofmitz E, Jeremias A, Gogia S, Kirtane AJ, Hill JM, Karmpaliotis D, Mintz GS, Maehara A, Stone GW, Shlofmitz RA, Ali ZA. Therapeutic Approach to Calcified Coronary Lesions: Disruptive Technologies. Curr Cardiol Rep. 2021 Mar 5;23(4):33.

Images

Figure 1- Guidelines for Approach to Calcified lesions

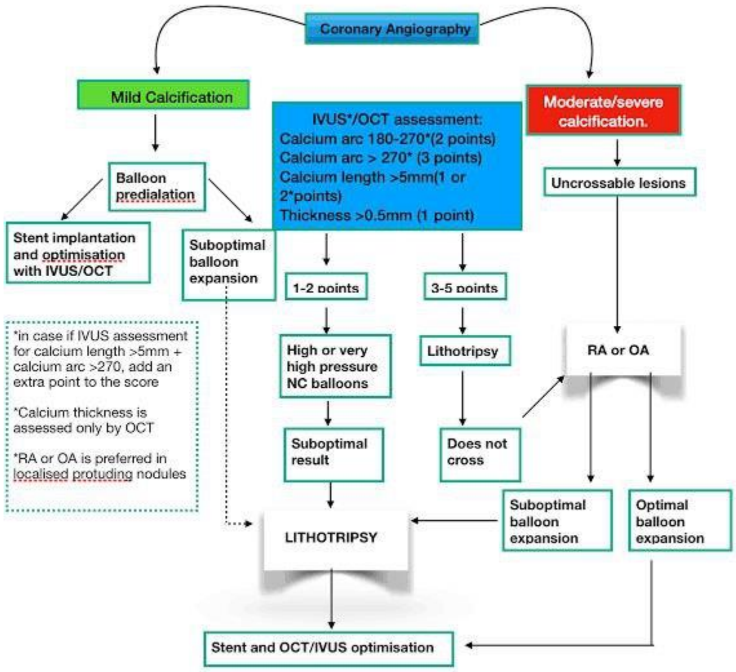

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Figure 2 Showing heavily Calcified LAD

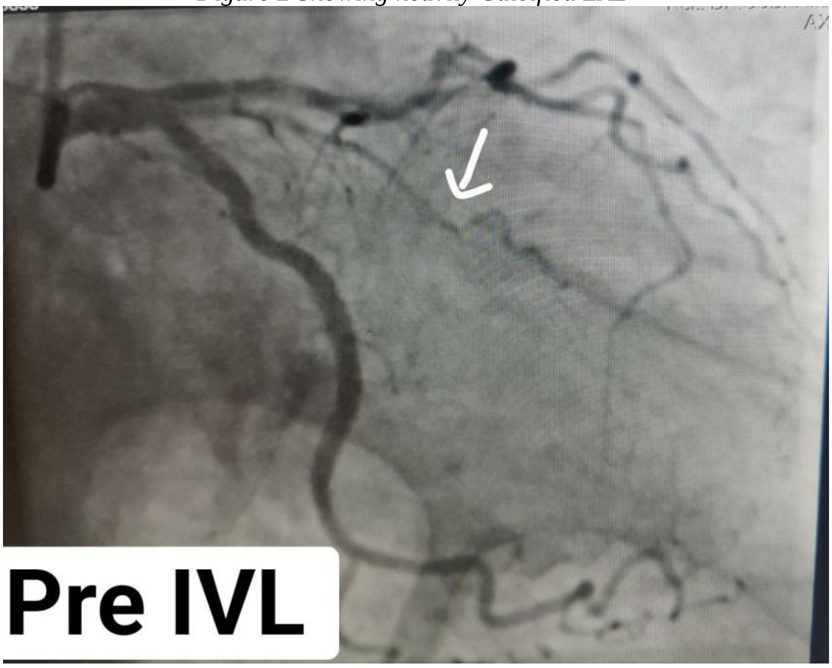

Figure 3 Showing Post IVL opening up of LAD

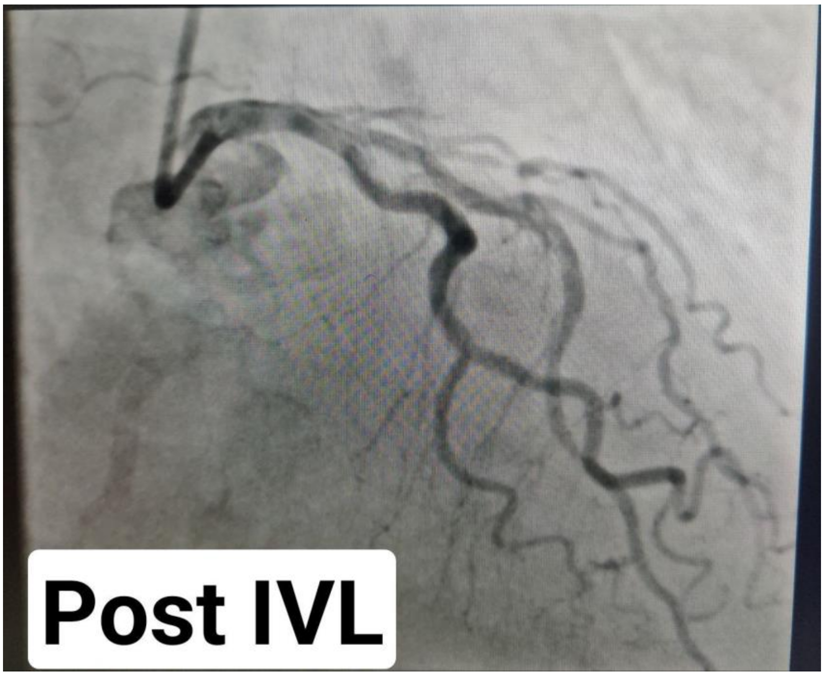

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Figure 4 *Showing Post PCTA*

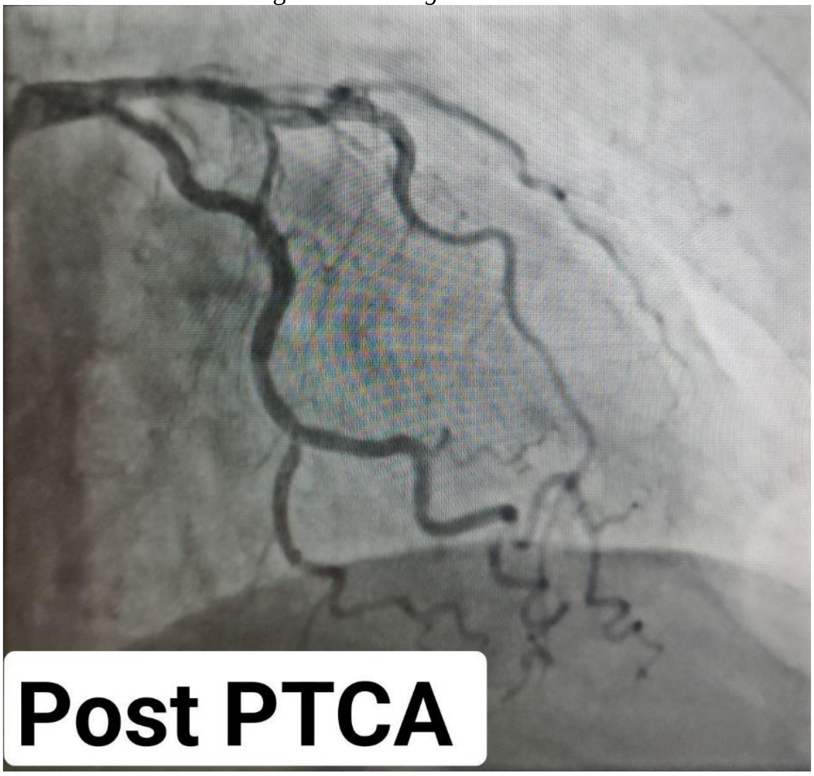

Figure 5

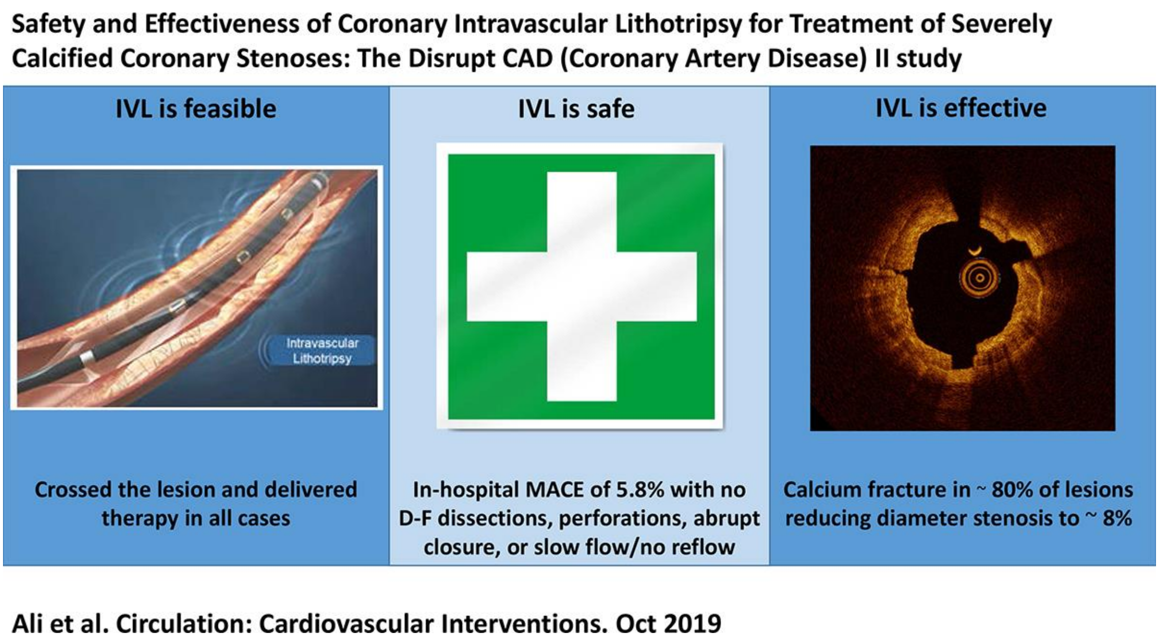

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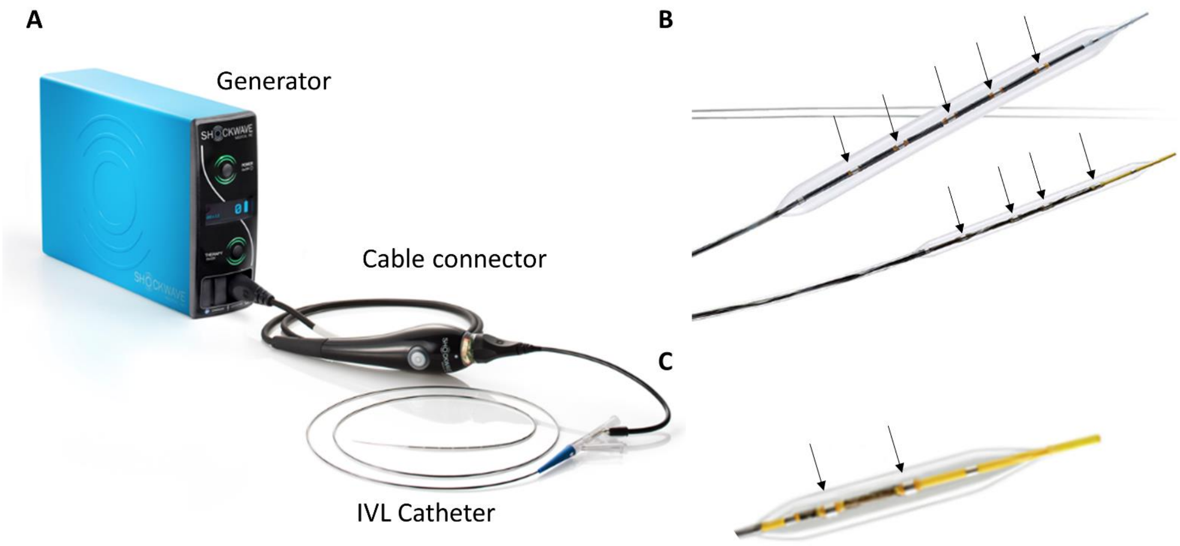
Figure 6 – Showing IVL setup



A. The IVL set-up consists of a portable and battery-chargeable generator, a cable connector with a push button for IVL activation, and the IVL catheter.
B. The peripheral IVL catheters with integrated emitters (arrows).
C. Coronary IVL catheter with two emitters (arrows).

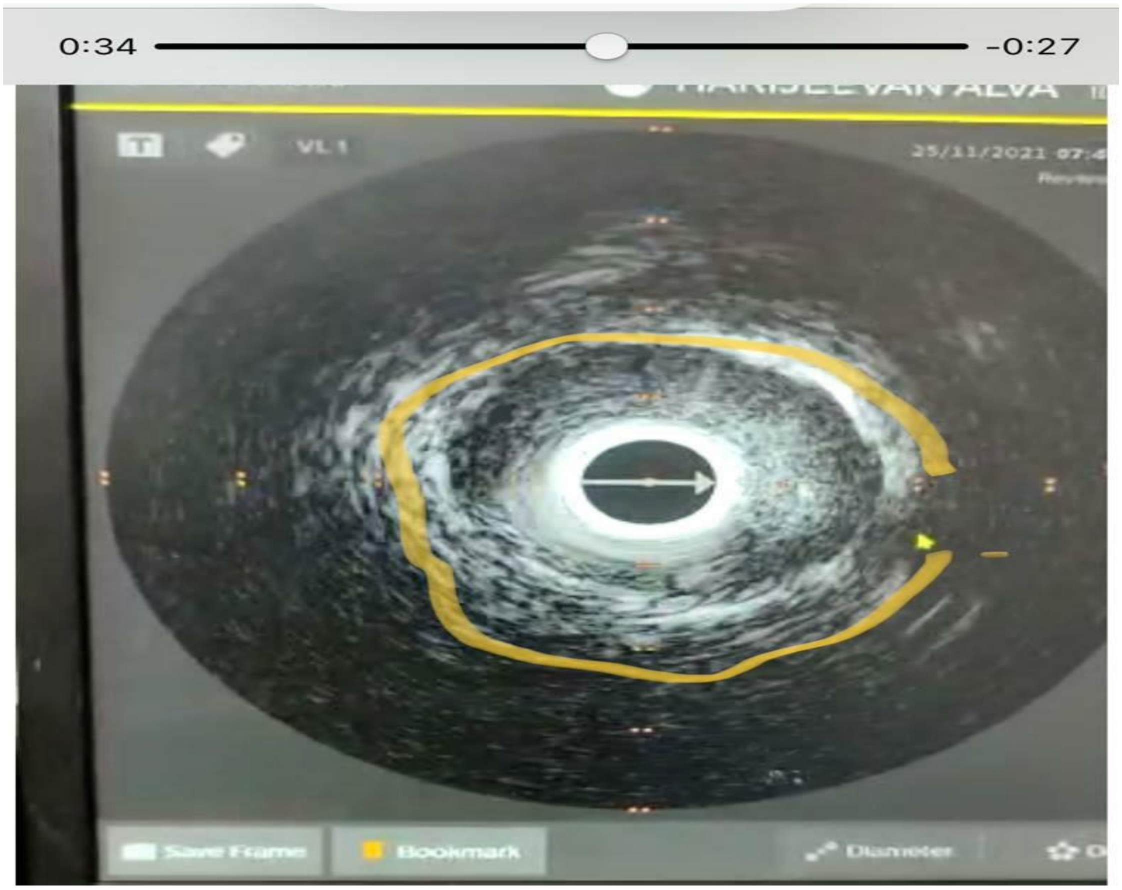


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Figure 7- IVUS showing more than 270° calcification

Table 1 Safety and efficacy endpoints in trials examining calcium modification techniques

Trial	ROTAXUS	PREPARE-CALC	ORBIT II	COAST	Disrupt CAD I	Disrupt CAD II	Disrupt CAD III
Treatment	RA + 1st-gen DES	RA + 2nd-gen DES	Classic Crown OA + 2nd-gen DES/BMS	Micro Crown OA + 2nd-gen DES/BMS	IVL + 2nd-gen DES	IVL + 2nd-gen DES	IVL + 2nd-gen DES
Number of patients	120	100	443	100	60	120	431
Peri-procedural complications							
Dissection (%)	3.3	3.0	3.4	2.0	0.0	1.7	0.3
No reflow/slow flow (%)	0.0	2.0	0.9	2.0	0.0	0.0	0.0
Perforation (%)	1.7	4.0	1.8	2.0	0.0	0.0	0.3
In-hospital MACE	4.2	–	9.8	14.0	–	5.8	7.0
Follow-up events[a]							
MACE	24.2	–	16.9	22.2	5.0	7.6	7.8
Target vessel revascularization	16.2	3	5.8	9.4	0.0	0.8	1.6
Target lesion revascularization	–	2	4.7	6.3	–	–	1.3