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Successful Shockwave intravascular lithotripsy for severely calcified, undilatable lesion of the left anterior descending coronary artery in patient with recurrent myocardial infarction.

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Short Title: **Intravascular lithotripsy for severely calcified lesion – case report**

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Successful coronary stent implantation is challenging in the presence of severe calcifications. Adequate lesion preparation before stenting is crucial in order to avoid severe procedural and late complications. Lesion predilatation with non-compliant (NCB), scoring or cutting balloon (CB) is a standard of care, however doesn't provide optimal stent expansion and apposition. Rotational and orbital atherectomy is indicated in selected cases, but associated with higher risk of procedural complications [1]. Coronary intravascular lithotripsy (IVL) is a new technique designed to facilitate PCI in calcified lesions with encouraging results in clinical trials [2]. The Shockwave IVL catheter contains multiple lithotripsy emitters on a balloon. Sonic waves, produced circumferentially, selectively fracture calcium, altering vessel compliance, maintaining the fibroelastic architecture and allowing full balloon opening at low pressures (4-6atm). We present a case of 79y.o. female, who underwent first successful treatment with ShockwaveC2 IVL catheter in our Institution.

The patient had a history of diabetes, arterial hypertension, moderate chronic kidney disease and prior PCI in LAD in 2007. She was admitted to regional center with anterior wall STEMI, as a complication of knee alloplasty. An emergency angiography revealed severely calcified, critical narrowing of left anterior descending coronary artery (Figure A). Several inflations of NCB 2.5-2.75mm were unsuccessful (Figure A panel) and resulted in type B/C dissection distal to the stenosis, which was treated with 2 drug-eluting stents (DES), leaving undilated lesion between stents (Figure A red arrow). Few days later patient experienced recurrent rest angina and ventricular tachyarrhythmia and was referred to our center for repeat high-risk PCI. Rotational atherectomy was considered, however waived due to higher risk of complications associated with a history of recurrent MI and presence of newly implanted stent at the distal edge of the culprit stenosis [1,3]. To facilitate adequate undilatable lesion preparation we decided to use IVL (Figure B).

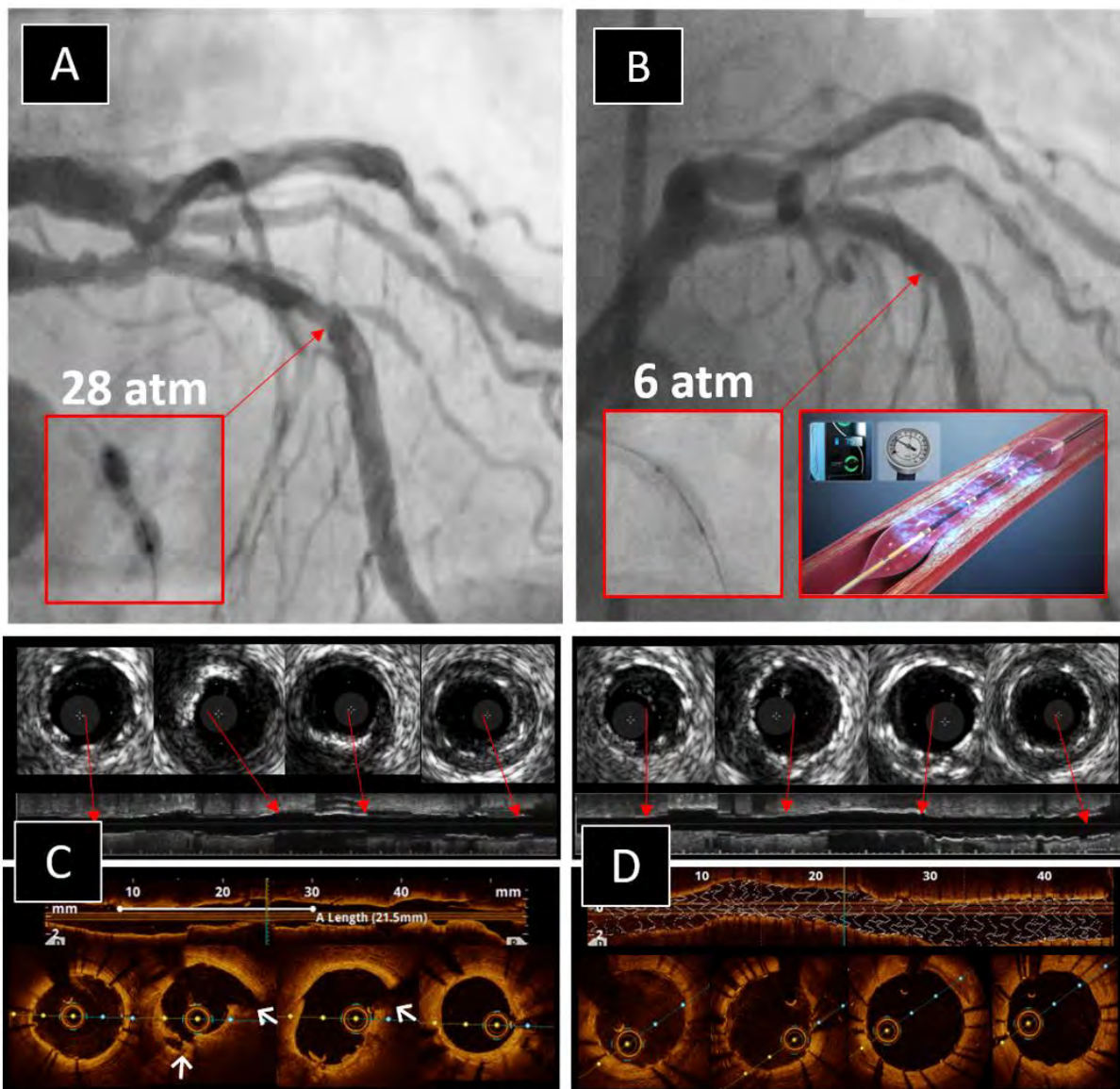
Transfemoral approach using 7F extra-back-up guiding catheter was chosen. Neither baseline IVUS nor OCT imaging was possible because systems did not cross the lesion. Predilatation with NCB 2.5mm (max.16atm) was performed, which allowed successful SHOCKWAVEC2 3.0x12mm catheter delivery to

the culprit lesion. Sixty applications (at 4atm) in the middle and proximal parts of LAD were done (Figure B panel) achieving full dilatation of the IVL balloon at 6atm. The IVUS and OCT images obtained after IVL revealed presence of calcium cracks at the culprit lesion (Figure C white arrows). Then, the ultra-thin (60 μ m) DES 3.0x30mm was successfully implanted with proper overlap with previously implanted stents. Control angiography, IVUS and OCT confirmed optimal PCI result with perfect stent expansion and apposition (Figure D). No complications occurred during hospitalization and patient was discharged home 48h after the procedure free of angina and ventricular arrhythmia.

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Figure



Panel A – Baseline LAD angiogram, partial dilation of cutting balloon at high pressure (panel), result after primary PCI with undilated space between stents (red arrow)

Panel B – Final result after intravascular lithotripsy, Shockwave balloon fully opened at 6atm (panel);

Panel C – IVUS and OCT cross sections post IVL from distal to proximal part of LAD, crackles in plaque (white arrows).

Panel D – IVUS and OCT cross sections with symmetric, full opening of the DES in previously undilatable lesion.