Combined orbital atherectomy and intracoronary lithotripsy assisted by mechanical circulatory support in a patient with NSTEMI and the last remaining vessel

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Severely calcified coronary stenoses remain a significant challenge during percutaneous coronary intervention (PCI), often requiring advanced devices for lesion preparation [1–3]. Such high-risk intervention (hr PCI) is even more demanding if performed within a last remaining vessel in patients presenting with acute coronary syndromes, sometimes requiring additional mechanical cardiac support (MCS) [4].

A 67-year-old male smoker presented with non-ST-segment elevation myocardial infarction. He had the following comorbidities: hypertension, hypercholesterolemia, orally controlled diabetes, chronic pulmonary obstructive disease, and peripheral artery disease. Echocardiography showed decreased left ventricular ejection fraction of 30% with a scar of the inferior and lateral walls and hypokinesia of the septum and anterior wall. Coronary angiography revealed chronic total occlusion of the right and circumflex coronary artery, with very weak collateral flow and severely and diffusely narrowed left main (LM) and left descending arteries (LAD) with calcifications (Figure 1A). His SYNTAX Score I was 49.5. The patient was discussed with the Heart Team and scheduled for hr PCI with MCS due to diffuse disease of the LAD. Owing to low bleeding risk, prasugrel was administered. The right radial artery in which a 7in6 French sheath was inserted for PCI was also used for appropriate angiographically guided puncture of the right femoral common artery. After obtaining right femoral access, two suture-mediated closure systems were inserted followed by insertion of a dedicated 19 F MCS sheath with subsequent Impella CP (Abiomed, Danvers, MA, US) placement within the left ventricle. Next, a 7-French extra backup guide catheter was introduced in the LM ostium. A Viperwire Advance (CSI, St. Paul, MN, US) facilitated orbital atherectomy (OA) with the Diamondback 360 coronary system (CSI, St. Paul, MN, US). Thanks to a glide assist feature, the 1.25 mm crown was able to go across all tight and calcified lesions to the relatively healthy mid portion of the LAD, and OA was launched going backward with 80k rpm and forward with the same speed. After treatment of the medial part of the LAD, OA with 120k rpm was performed within the proximal part of the LAD, including several passes with low and high speed. No pressure drop was noticed during OA (Figure 1B). Afterward, intracoronary imaging with the use of high-definition intravascular ultrasound (HD-IVUS; Boston Scientific, Natick, MA, US) revealed 360° calcium arches within the LM and LAD (Supplementary material, *Figure S1*). Despite aggressive pre-dilatation with 2.0, 2.5, and 3.0 non-compliant balloons, the balloons could not fully open, so intracoronary lithotripsy (IVL; Shockwave Medical, Fremont, CA, US) was used with 3.5 and 4.0 balloons which fully expanded at 4–6 atmospheres after application of 80 pulses of ultrasound energy (160 pulses in total). During IVL, a flat pressure curve was observed (Figure 1C). Finally, three drug-eluting stents were successfully implanted, followed by post-dilation with non-compliant balloons. Optimal angio-

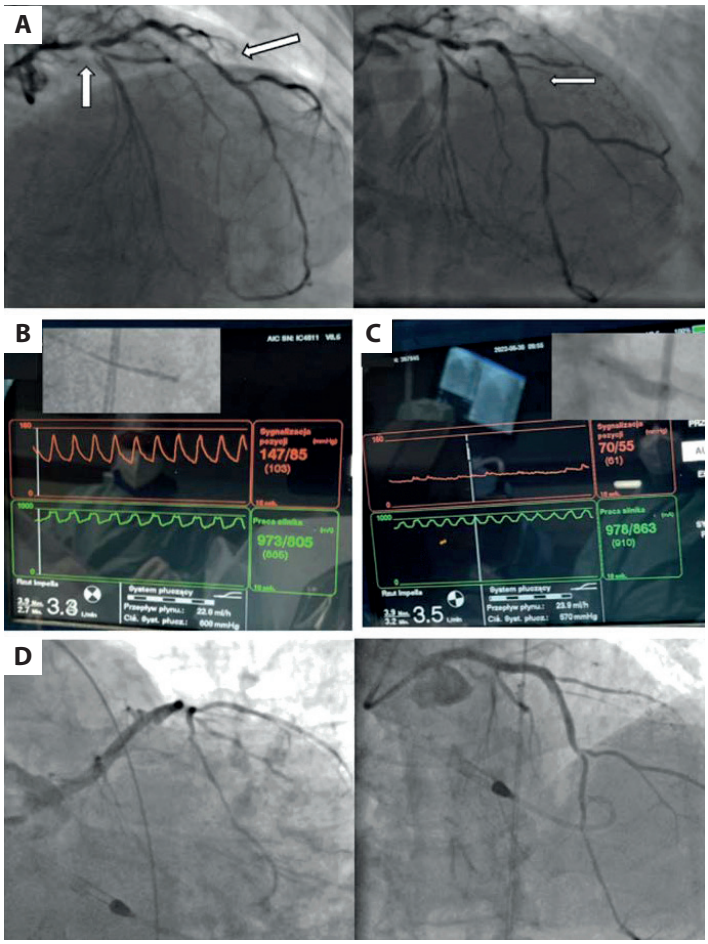

Figure 1. A. Coronary angiography with severe narrowing and excessive calcifications (white arrows) within the left main and left anterior descending arteries. **B.** Aortic pressure curve during orbital atherectomy showing normal waveform. **C.** Aortic pressure curve flattening during intravascular lithotripsy application. **D.** Final angiographic result in the left main and left anterior descending arteries

graphic result of PCI was confirmed with HD-IVUS (Figure 1D and Supplementary material, *Figure S2*). The MCS system was withdrawn, and the large bore access was closed. No bleeding complications occurred. On discharge, the patient presented with left ventricular ejection fraction of 45% and no symptoms of angina.

Article information

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