Successful intravascular lithotripsy for covered stent underexpansion due to severely calcified plaque

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Calcified coronary lesions increase the risk of periprocedural complications and long-term adverse clinical outcomes, especially in patients with myocardial infarction.[1] The gold standard for accurate lesion assessment, especially calcium detection, is intravascular imaging (optical coherence tomography [OCT], intravascular ultrasound [IVUS]).[2] The greater arc, length, or thickness of the calcium component on OCT or IVUS increases the likelihood of stent underexpansion and malapposition. In the setting of resistance of the lesion to high-pressure and modified balloon catheters, such as cutting and scoring balloons, orbital and rotational atherectomy is recommended in selected patients.[3] However, in the case of metal stent underexpansion, rotational atherectomy is associated with a higher risk of procedural complications. Shockwave intravascular lithotripsy (S-IVL) has emerged as a new treatment for heavily calcified coronary lesions, which is especially useful when other treatments are ineffective or impossible to apply.[4] As shown by the following case, S-IVL is also effective as a bailout strategy inside the implanted and covered stents.

A 76-year-old woman with hypertension, rheumatoid arthritis, and hyperlipidemia without previous history of coronary artery disease was admitted to a local hospital with non–ST-segment elevation myocardial infarction. Emergency angiography revealed critical stenosis in the proximal segment of the left anterior descending artery (LAD) as well as the proximal and distal segments of the left circumflex artery (LCx). The LAD was recognized as a culprit artery and was successfully treated with percutaneous coronary intervention (PCI). During the same procedure, unsuccessful PCI of the distal LCx with incomplete stent deployment was performed (FIGURE 1A and 1B). The patient was referred to our center 2 days later for further treatment.

First, we decided to postdilate the unexpanded stent with a noncompliant balloon (3.0 × 15 mm) to high pressure (26 atm), obtaining a full expansion of the balloon. However, a control contrast injection revealed type III perforation in the area of the implanted stent (FIGURE 1C). Immediately, the balloon was inflated with low pressure (6 atm) at the perforation site. Due to ineffective prolonged balloon inflations, we successfully implanted the covered stent (Bentley InnoMed, Hechingen, Germany; 3.0 × 24 mm). However, the IVUS image showed the presence of calcium cracks in both segments of the LCx and suboptimal stent-graft expansion (FIGURE 1D). We decided to use S-IVL (3.0 × 12 mm). In total, 60 applications (at 4 atm) in the proximal and distal LCx were delivered, obtaining an optimal expansion of the S-IVL balloon at 6 atm. Then, we implanted a drug-eluting stent (3.0 × 24 mm) in the proximal segment of the LCx (FIGURE 1E). The optimal effect of the procedure was confirmed by IVUS (FIGURE 1F). No further complications occurred during hospitalization.

The presented case emphasizes that a direct use of S-IVL instead of a high-pressure noncompliant balloon for postdilation of an underexpanded stent has become a new standard of care associated with a lower risk of procedural complications.

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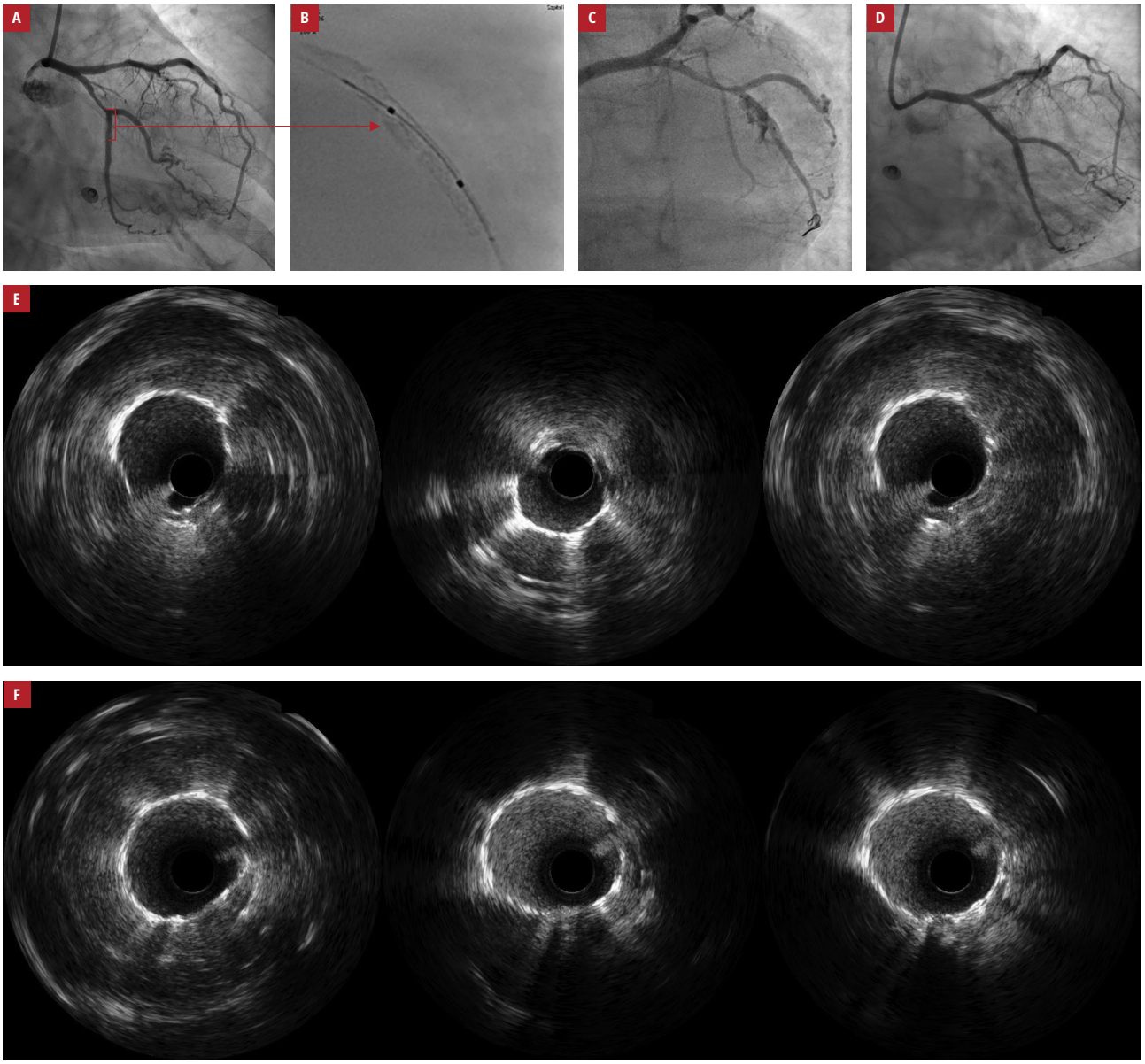

FIGURE 1 **A** – an anterior-posterior caudal angiographic view before percutaneous coronary intervention (PCI): significant stenosis of the proximal left circumflex artery (LCx) and an unexpanded stent distally, invisible on angiography; **B** – stent underexpansion on StentBoost-enhanced image; **C** – perforation of the LCx after postdilation; **D** – an anterior-posterior caudal angiographic view post-PCI; **E** – intravascular ultrasound (IVUS) cross sections of the distal LCx after covered stent implantation and before shockwave intravascular lithotripsy (S-IVL); **F** – IVUS cross-sections after S-IVL inside the covered stent

ARTICLE INFORMATION

CONFLICT OF INTEREST None declared.

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