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Coronary intravascular lithotripsy and severe stent underexpansion

Litotrícia coronária e sub-expansão grave do *stent*

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Coronary intravascular lithotripsy (IVL) has been postulated as a new option for the treatment of non-dilatable calcified lesions. Its use in underexpanded stents is off-label, given the damage it may cause to the polymer or scaffold of the device.

A drug-eluting stent implanted the previous month in the mid anterior descending artery showed severe central underexpansion. Despite prolonged post-dilatation with a non-compliant balloon (3.5 mm at 22 atm for 10 min), the final result was suboptimal (Figure 1A and B, Video 1). Given the risk of thrombosis or restenosis, a new procedure was planned for optimization by IVL. A Shockwave™ catheter (3.5 mm×12 mm) was applied for eight cycles of 10 pulses and the stent was successively dilated with a 3.5 mm non-compliant balloon. Despite clear improvement in luminal area, underexpansion assessed by angiography and optical coherence tomography (OCT) persisted (Video 2). It was therefore decided to apply the 3.5 mm×12 mm Shockwave™ catheter for another eight cycles. Subsequent OCT showed calcium cracking and increased minimum luminal area, without clear evidence of scaffold distortion (Figure 2A-C, Video 3). The stent boost image did not clarify the integrity of the device (Figure 2D). A new drug-eluting stent was implanted in the first stent, followed by optimization with a 4.0 mm non-compliant balloon, with a good final result (Figure 3A and B, Videos 4 and 5).

IVL is a new option for the treatment of severe stent underexpansion. It remains to be clarified in future studies whether the best subsequent therapeutic option is stent-in-stent implantation or drug-eluting balloon dilatation.

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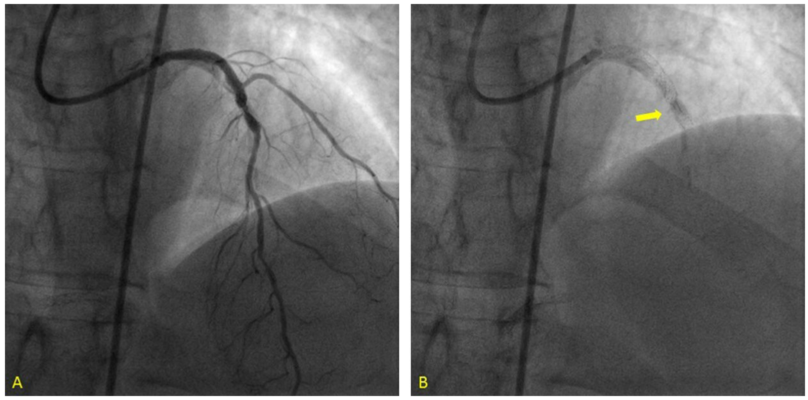

Figure 1 (A) Angiographic image showing severe underexpansion of the stent implanted in the mid anterior descending artery; (B) fluoroscopy image showing the 'dog-bone' shape of the previously implanted stent.

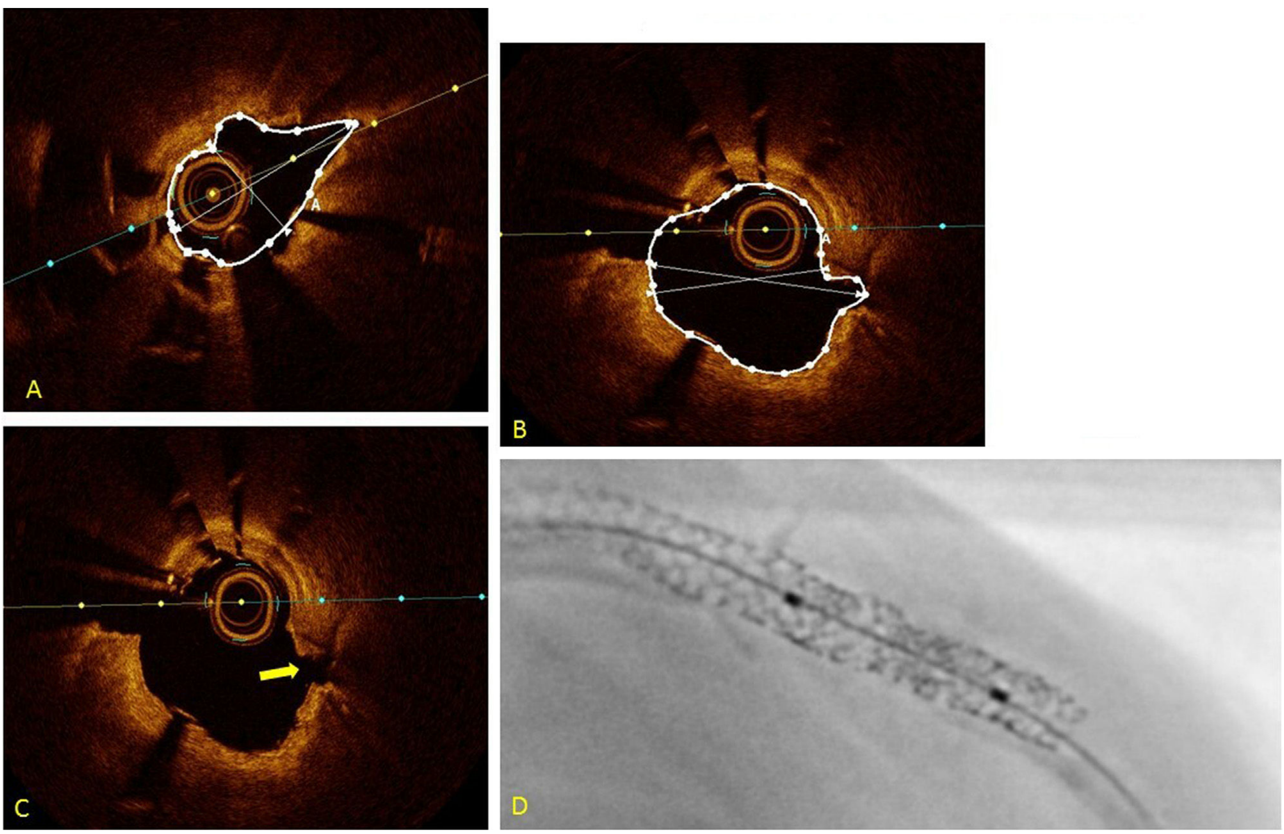

Figure 2 (A) Optical coherence tomography image after the first cycle of coronary lithotripsy showing the severely underexpanded stent implanted under calcified plaque, with areas of rupture and minimum luminal area of 1.97 mm^2; (B) optical coherence tomography image after the second cycle of coronary lithotripsy, with minimum luminal area of 3.79 mm^2; (C) image of rupture of in-stent calcified plaque after application of coronary lithotripsy; (D) stent boost after application of coronary lithotripsy, showing luminal gain without clarifying the integrity of the scaffold.

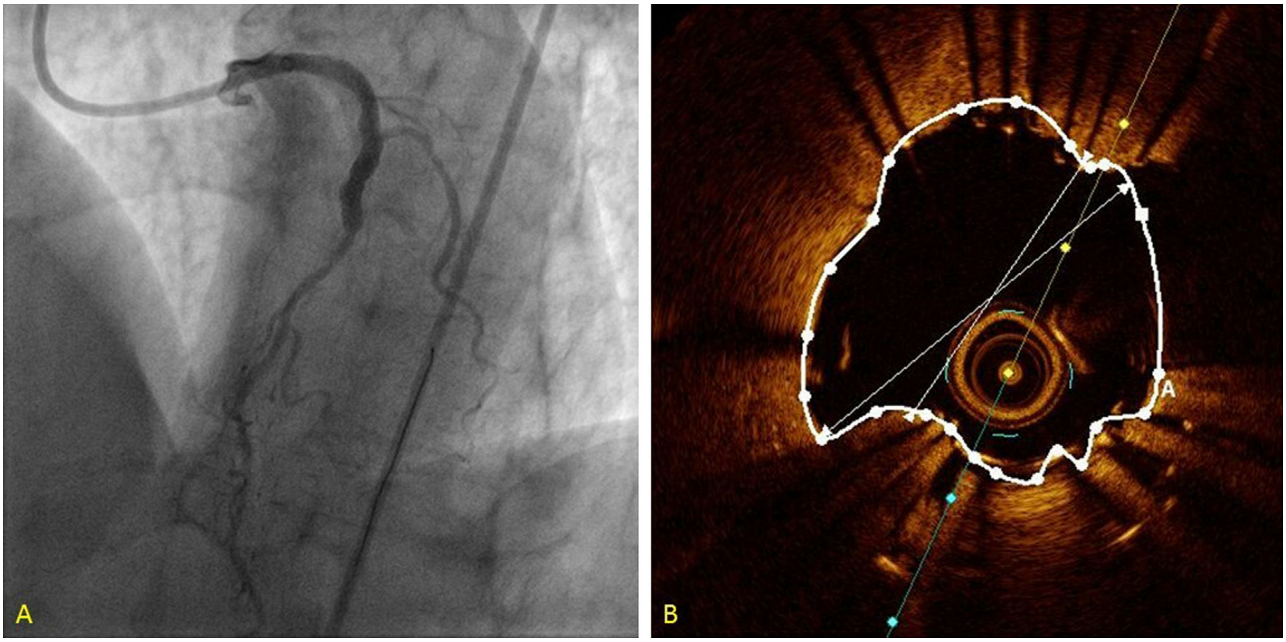

Figure 3 (A) Final angiographic result after stent-in-stent implantation; (B) final result by optical coherence tomography, showing evidence of slight underexpansion and a minimum luminal area of 5.07 mm^2.

Conflicts of interest

The authors have no conflicts of interest to declare.

Appendix A. Supplementary material

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.repc.2019.05.011.