

MINI-FOCUS ISSUE: CORONARIES

ADVANCED

EDITOR'S HIGHLIGHTS

Deferred Intravascular Lithotripsy-Facilitated Stenting in ACS



Novel Approach to Improve PCI Outcomes in Severe Calcification?

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ABSTRACT

Moderate/severe calcification, present in approximately one-third of culprit lesions in acute coronary syndromes (ACS), portends unfavorable procedural and post-primary percutaneous coronary intervention outcomes. Intravascular lithotripsy is a novel technique using shockwaves to fracture calcific plaques. Presenting a clinical case, we enumerate efficacy and safety parameters in using intravascular lithotripsy in ACS. (**Level of Difficulty: Advanced.**)

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Moderate/severe calcification, present in approximately 30% of culprit lesions in acute coronary syndromes (ACS) (1), adversely affects safety/efficacy of primary percutaneous coronary intervention (PCI) and portends worse post-PCI outcomes (1). Although atherectomy is contraindicated in thrombotic coronary lesions, intravascular lithotripsy (IVL) may mitigate the adverse consequences of severe calcification (2). IVL, however, has not been tested in ACS and DISRUPT-CADIII trial (Disrupt CAD III With the Shockwave Coronary IVL System; [NCT03595176](https://clinicaltrials.gov/ct2/show/study/NCT03595176)), designed for premarketing approval of coronary IVL, has excluded patients with ACS.

An alternative approach for PCI on severely calcified culprit lesions was undertaken in a 65-year-old woman with inferior ST-segment elevation myocardial infarction (STEMI) (Figure 1). IVL use was approved by the institutional review board at our institution.

Safety of IVL in thrombus-laden lesions is unknown. Insonification of platelet/fibrin-rich thrombi by shockwaves may result in thrombus degradation/embolization. Shockwaves can induce myocardial depolarization (2). Although an R-on-T phenomenon inducing tachyarrhythmia has not been substantiated in

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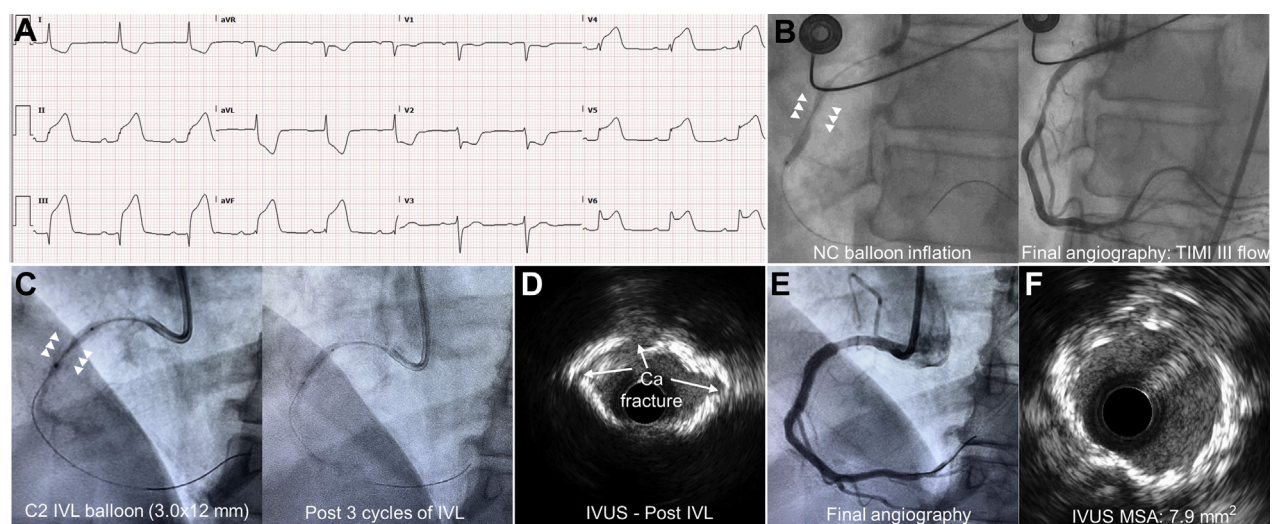
stable coronary lesions (2), such a risk in electrically excitable myocardium during early reperfusion is unknown. Thus, “off-label” IVL use in acute STEMI is not recommended.

We propose that IVL can be used in staged stenting procedure during which thrombus burden and myocardial electrical instability may be substantially less. This approach is supported by the DEFER-STEMI (Deferred Stent Trial in STEMI), in which deferring stent implantation in STEMI resulted in reduced no-reflow and increased myocardial salvage, with approximately 4% needing urgent PCI before the staged procedure (3).

**ABBREVIATIONS
AND ACRONYMS**

- ACS** = acute coronary syndromes
- IVL** = intravascular lithotripsy
- PCI** = percutaneous coronary intervention
- STEMI** = ST-segment elevation myocardial infarction

FIGURE 1 Staged Intravascular Lithotripsy-Facilitated Stent Deployment in STEMI



(A) A 65-year-old woman presented with inferior STEMI. Heart rate = 70 beats/min and blood pressure = 110/60 mm Hg. (B) High-pressure noncompliant balloon inflation failed to dilate the severely calcified culprit lesion (arrowheads). TIMI flow grade 3 was achieved, and stenting was deferred. (C) At a staged procedure, a 3 × 12-mm IVL balloon was inflated (4 atm) and 3 cycles of IVL delivered. Post-IVL, full balloon inflation was noted. (D) Post-IVL IVUS revealed multiple fractures in the concentric calcification (arrows). (E) A 3 × 23-mm drug-eluting stent was implanted and post-dilated with a 3.5 × 20-mm noncompliant balloon (at 22 atm). Final angiography revealed optimal stent expansion and TIMI flow grade 3. (F) IVUS MSA = 7.9 mm². No slow-flow/no-reflow, arrhythmia, or hemodynamic compromise were noted during the staged procedure. Ca = calcium; IVL = intravascular lithotripsy; IVUS = intravascular ultrasound; MSA = minimal stent area; NC = noncompliant; TIMI = Thrombolysis In Myocardial Infarction.

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