

## Undilatable Coronary in Stent Restenosis – Still Difficult to Handle in this Era

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### Abstract:

Despite advancing the new stent, balloon, and other therapeutic technologies in interventional cardiology, there is no consensus on the best treatment for undilatable coronary in-stent restenosis. We present a classical rotational atherectomy strategy to manage undilatable in-stent restenosis with single or multiple stent layers with future perspectives.

**Keywords:** Percutaneous coronary intervention; In-stent restenosis; Undilatable lesion; Coronary atherectomy

### Description/ Introduction

Despite today's advances in coronary intervention technology, balloon-resistant in-stent restenosis (ISR) remains a challenging lesion for interventional cardiologists to treat appropriately and achieve optimal results. Originally under expanded and undilatable ISR is associated with a high rate of repeat restenosis [1]. Causes of balloon resistance could be calcified neoatherosclerosis, stent under expansion due to thick circumferential calcium behind the stent, other mechanical problems such as stent fracture, or restenosis due to multiple layers of stents. To treat the undilatable ISR lesions, theoretically, we need in-stent plaque modification, expansion of the old stent with one or more layers, or plaque modification behind the stents. Treatment devices may include cutting/scoring balloons, high-pressure balloons, atherectomy (rotational, orbital and laser), drug-coated balloons (DCB), intravascular brachytherapy, and shockwave intravascular lithotripsy [2]. The current ESC guidelines provide Class IA with DCB to treat ISR with drug-eluting stents or bare-metal stents, but they are still not commercially available for coronary ISR in the United States. On the other hand, the use of brachytherapy increased significantly recently from the large nationwide cohort study [3]. Aggressive plaque modification and lesion preparation with atherectomy are essential to facilitate balloon angioplasty and stenting [4]. The use of coronary imaging to evaluate the mechanism of ISR is recommended by the ACC/AHA/SCAI and ESC/EACTS guidelines as Class IIA, and the best treatment strategy available would be determined accordingly [5,6].

In our article, Yasumura K, et al. (2020) [7] report the outcomes of 26 patients with balloon-resistant single-layer (30.8%) or multi-

layer (69.2%) ISR treated with rotational atherectomy (RA) at a single institution. After RA, they were treated with new drug-eluting stent implantation (34.6%) or intravascular brachytherapy (23.1%). Angiographic success was achieved in 92.3%, and procedural success was achieved in 84.6%. In-hospital major adverse cardiac events (MACE) occurred in 15.4%, all due to periprocedural non-Q wave myocardial infarction. Within one year, MACE occurred in 34.6% of patients with 19.2% target lesion revascularization (TLR). The results showed favorable procedural outcomes and a relatively high rate of MACE driven by ischemia-driven TLR within one year. The low use of intravascular imaging could be partly attributed to the relatively high rates of TLR.

Shockwave intravascular lithotripsy produces mechanical waves propagating from the balloon and modifies both superficial and deep calcium without affecting soft tissues. Additional areas of interest and investigation concerning modification of vascular calcification include ISR or under expanded coronary stents [8]. It is expected to be suitable if the cause of stent dilation failure is due to the circumferential calcium behind the stent layers. Of course, this would require adequate safety testing.

Further studies are warranted to compare the safety and effectiveness of existing and future debulking or plaque modifying techniques for undilatable ISR lesions with high-use of intravascular imaging.

### Conclusion

Further improvement of the treatment strategy for ISR refractory to balloon-angioplasty is needed concerning long-term clinical

outcomes. Therefore, a continuous investigation is warranted with existing debulking or calcium modifying techniques for undilatable ISR lesion with intravascular imaging guidance.

### Author Disclosure

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