Calcified In-Stent Restenosis
A Rare Cause of Dilation Failure Requiring Rotational Atherectomy

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The acute results of repeated interventions for patients with in-stent restenosis (ISR) are largely satisfactory, although some patients may still have recurrences.1,2 In this anatomic scenario, lack of initial angiographic success is exceedingly rare.1,2 We report a patient with “undilatable” ISR that eventually required rotational atherectomy to achieve procedural success. Optical coherence tomography (OCT) and intravascular ultrasound (IVUS) unraveled the presence of severely calcified intrastent tissue, leading to “resistant” ISR.

A 77-year-old man on hemodialysis was investigated for unstable angina. Coronary angiography revealed ISR of a bare metal stent that had been implanted in the right coronary artery 10 years before (Figure 1A). A saphenous vein graft to the left anterior descending coronary artery and a drug-eluting stent implanted at the left main toward the proximal circumflex coronary artery showed good results. Initial coronary intervention on the right coronary artery was unsuccessful because of resistant ISR. After failure of conventional balloons, 2 different noncompliant balloons eventually ruptured (20 bar) at the lesion site.

At a repeated procedure performed 1 week later, OCT imaging revealed severe and diffuse calcification of the intrastent tissue (Figure 1B, 1C, and 1D) with a minimal lumen area of 1.5 mm2. Some neointimal ruptures were recognized (attributed to the previous treatment), but additional images of neoatherogenesis—as thin-cap fibroatheroma—were not present. IVUS (Figure 1E) also

Figure 1. A, Angiography (lateral projection) showing diffuse in-stent restenosis (ISR). B through D, Optical coherence tomography images revealing calcified intrastent tissue (plus sign) with variable morphology and degree of lumen obstruction (asterisk denotes wire artifact). E, Intravascular ultrasound imaging disclosing calcified ISR shadowing the underlying stent struts.
showed severe intrastent calcification with a “napkin-ring” image shadowing most of the stent struts. Rotational atherectomy (bur size diameter, 1.75 mm) followed by sequential repeated (the first balloon ruptured) high-pressure (up to 28 bar) noncompliant balloon inflation allowed successful lesion dilation. Subsequently, 2 overlapping everolimus-eluting stents were implanted with excellent angiographic results (Figure 2A). Optimal stent expansion was confirmed by OCT and IVUS (Figure 2B and 2C).

Procedural failure in patients with ISR is very rare. In some cases, however, balloon slippage phenomena may complicate these procedures.1 In other patients, severe underexpansion of the underlying stent may be very difficult to tackle, and residual underexpansion may trigger recurrent ISR.2 This problem usually results from suboptimal initial stent deployment on heavily calcified lesions.2 Finally, neatherosclerosis—rather than classic neointimal hyperplasia—has been encountered in some patients with ISR, but the implications of this pathological finding remain unsettled.3 In this scenario, the terms “de novo” or “late atherosclerosis” might be preferred over late ISR. To the best of our knowledge, “resistant” ISR resulting from heavily calcified tissue within the stent has not been previously reported. This phenomenon was detected a decade after initial stent implantation in a patient with severe renal failure. Whether treatment of very “old” ISR should be different from that of ISR presenting within the typical time frame remains unknown. Although the implications of coronary calcification in patients on hemodialysis are well established, the presence and implications of calcified ISR in this population have not been studied.4

Rotational atherectomy was selected as the strategy of choice in our patients, although other techniques, such as cutting balloon angioplasty, may also be of value in heavily calcified lesions. The combined use of IVUS and OCT provided unique insights disclosing the underlying etiology accounting for dilation failure and proved to be instrumental to guide the repeated intervention.

Disclosures

None.

References


Key Words: restenosis • rotational atherectomy • coronary imaging
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Circ Cardiovasc Interv. 2012;5:e1-e2
doi: 10.1161/CIRCINTERVENTIONS.111.966606
Circulation: Cardiovascular Interventions is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
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Print ISSN: 1941-7640. Online ISSN: 1941-7632

The online version of this article, along with updated information and services, is located on the World Wide Web at:
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