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Background

Calcified nodule (CN)-related in-stent restenosis (ISR) remains one of the challenging lesions. Although rotational atherectomy (RA) is frequently used for heavily calcified ISR, recurrent restenosis may occur because peri-stent calcified tissue often remains insufficiently modified. Excimer laser coronary atherectomy (ELCA), particularly with contrast enhancement, may achieve deeper tissue modification extending beyond the stent struts.

Case Presentation

An 81-year-old man had previously undergone left main bifurcation stenting using the V-stenting technique in 2007. In 2023, ISR of the proximal left circumflex artery (LCx, Segment 11) was successfully treated with rotational atherectomy using 2.0- and 2.25-mm burrs. Three years later, he presented with recurrent severe ISR (99%) at the same lesion.

Optical coherence tomography (OCT) demonstrated protruding calcified nodules within the stent, reproducing the same morphological findings observed before the previous RA procedure. Because recurrent ISR developed despite aggressive rotational atherectomy, we selected ELCA to modify both intra-stent plaque and peri-stent calcified tissue.

Initial laser atherectomy was performed using a 1.4-mm catheter (60/40 mJ/Hz), followed by OCT confirmation of effective tissue vaporization. A 1.7-mm catheter was subsequently used with the same settings, resulting in further plaque debulking. However, residual calcified tissue remained because of the large vessel size. After distal protection with a Filtrap device, contrast-enhanced ELCA was performed. Follow-up OCT demonstrated marked reduction of calcified nodular tissue, improved stent expansion, and modification extending beyond the stent struts, including cracking and partial vaporization of peri-stent calcification. Lesion preparation was completed with a 4.0-mm cutting balloon followed by a 4.0-mm drug-coated balloon.

Importantly, comparison with OCT/OFDI images obtained after rotational atherectomy three years earlier demonstrated substantially greater plaque debulking and stent expansion following contrast-enhanced ELCA in the same ISR lesion.

Discussion

In this case, intra-coronary imaging demonstrating that contrast-enhanced ELCA achieved more effective modification of recurrent CN-related ISR than previous rotational atherectomy. Compared to RA, contrast-enhanced ELCA appeared to modify not only intra-stent tissue but also peri-stent calcification, resulting in superior lesion preparation and stent expansion. OCT findings suggested that this additional peri-stent calcium modification may contribute to improved procedural results and potentially better long-term patency.

Learning Points

Calcified nodule–related ISR can recur despite adequate rotational atherectomy.

Contrast-enhanced ELCA can effectively debulk calcified nodular tissue and modify peri-stent calcification.

OCT is valuable for identifying the mechanism of recurrent ISR and for demonstrating the unique tissue modification achieved by contrast-enhanced ELCA.