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Images in Cardiology

Detection of Trailing Edge of Calcified Nodule After Rotational Atherectomy Using Optical Frequency Domain Imaging

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A 77-year-old woman was admitted to the Kyoto First Red Cross Hospital because of sudden chest pain. Coronary angiography (CAG) indicated a severe stenosis in the just proximal left circumflex coronary artery (LCx) with flow delay and mild disease in the proximal right coronary artery (Supplementary Fig. S1, A-C). On the basis of the diagnosis of acute coronary syndrome, we subsequently performed transradial percutaneous coronary intervention (PCI) against the LCx ostial lesion. Preprocedural optical frequency domain imaging (OFDI) showed a high-backscattering eccentric mass followed by low-intensity area with diffuse border protruding from the opposite side of the left-main carina and intermediate-branch carina and connecting with the proximal/distal calcium plates, indicating a calcified nodule (Fig. 1B-D). Taking the CAG and OFDI findings into consideration, we planned to perform stentless PCI using rotational atherectomy (RA) followed by drug-coated balloon (DCB) dilation. After RA with 1.25/1.75-mm burrs (Supplementary Fig. S1D) and predilation with a 2.25/10-mm conventional balloon, we inflated a 2.75/15-mm DCB (Supplementary Fig. S1E) under the guidance of OFDI (Fig. 1). Repeat OFDI confirmed gradual deep gutter formation inside the calcified nodule, and resultant luminal enlargement without major dissections (Fig. 1). The trailing edge of the calcified nodule became visible during the procedure (Fig. 1, J, K, N, O, white arrows). The final CAG showed an acceptable result without flow delay (Supplementary Fig. S1F). She has been free of cardiovascular events for 9 months since the PCI.

Compared with intravascular ultrasound imaging, optical coherence tomography/OFDI has the potential to identify the details of coronary calcification, including a calcified nodule.[1] In particular, optical coherence tomography/OFDI can detect not only the leading edge but also the trailing edge of a calcified plate, namely, “calcium thickness,” whereas intravascular ultrasound imaging can only depict the leading edge. A recent report from Japanese investigators indicated that based on the histopathological validation analysis, calcium thickness < 893 μm was a cutoff value to predict OFDI-measurable superficial dense calcified plates.[2] According to the report, the leading edge of calcification was visualized in 100% of all superficial calcified plates and calcified nodules on OFDI, whereas the trailing edge of calcification was identified in 55% of superficial calcified plates but none of the calcified nodule.[2] The calcified nodules often contain fibrin deposition and neovascularization within these nodules on histology, which might account for signal attenuation in these nodules on OFDI. In the present case, there is a possibility that a deep calcified plate might be located at the bottom of the calcified nodule, and the trailing edge of the deep calcified plate could be detected on OFDI after rotablation of the overlying calcified nodule.

Even for LCx ostial lesions, stent-based PCI is a mainstay of revascularization therapy. For LCx “just” ostial lesions, LCx ostial stenting is technically difficult, and left main-LCx crossover stenting after predilation with a balloon, followed by kissing balloon inflation might be a standard PCI strategy. However, target lesion revascularization (TLR) rate at the LCx ostium is high in cases undergoing left main-LCx single-stent crossover implantation,[3] and stentless PCI might be theoretically an alternative revascularization therapy of choice for LCx ostial lesions. In addition, calcified nodule-associated

Novel Teaching Points

- Trailing edge of the calcified nodule/deep calcified plate became visible after RA on OFDI.
- Serial OFDI images enabled us to perform RA effectively and safely.
- Stentless PCI using RA and DCB under OFDI guidance might be a revascularization therapy of choice for the LCx ostial lesion due to calcified nodule.

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Ethics Statement: Informed consent was obtained for all procedures described in the present manuscript.

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See page 217 for disclosure information.

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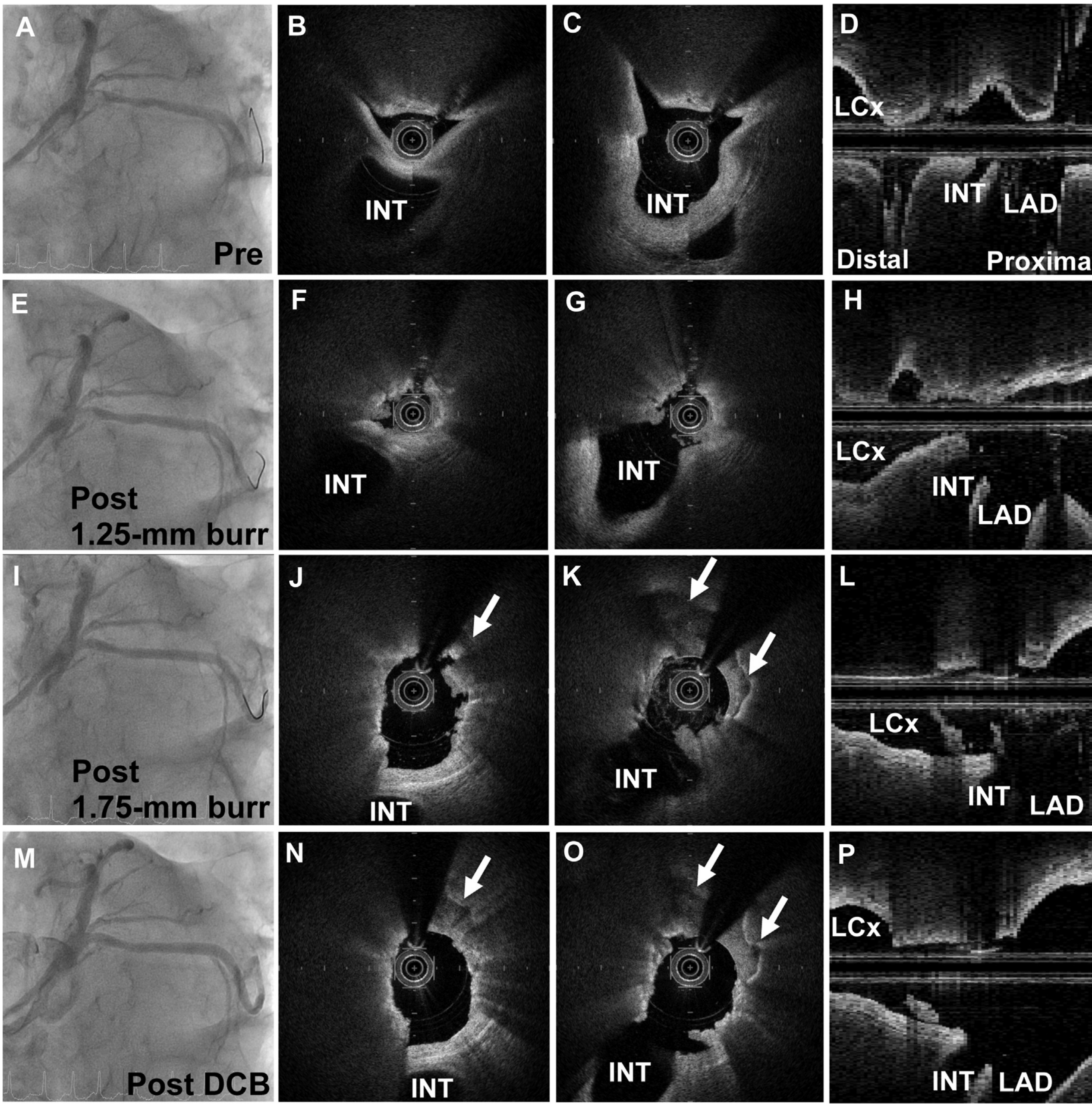

Figure 1. Serial left coronary angiography (CAG) (left anterior caudal view) and optical frequency domain imaging (OFDI) images during the stentless percutaneous coronary intervention (PCI) (**A-D**, preprocedural; **E-H,** postablation with 1.25-mm burr; **I-L,** postablation with 1.75-mm burr; **M-P**, after drug-coated balloon [DCB] dilation). Short-axis images (**B, F, J, N,** just distal to the bifurcation of intermediate branch; **C, G, K, O,** bifurcation of intermediate branch) and long-axis images (**D, H, L, P**) of OFDI. **White arrows** indicate trailing edge of the calcified nodule. INT, intermediate branch; LAD, left anterior descending coronary artery; LCx, left circumflex coronary artery.

in-stent restenosis has been becoming a significant problem even in the new-generation drug-eluting stent era.[4] This type of in-stent restenosis tends to be resistant to DCB and frequently requires repeat PCI. Thus, we should first debulk calcified nodules as much as possible by RA, irrespective of stent-based or stent-less strategy.

Considering the technical point of view, information regarding wire bias is indispensable for RA. As shown in the preprocedural OFDI images (Fig. 1B, C), the wire was located adjacent to the calcified nodule (opposite side of intermediate-branch carina and left-main carina). Repeat OFDI confirmed gradual deep gutter formation inside the calcified nodule, thickness of the residual calcified nodule/deep calcified plate, and resultant luminal enlargement without injury of the carinas (Fig. 1, F, G, J, K). On the basis of these serial OFDI findings, we judged that we could debulk the calcified nodule by RA effectively and safely.

Disclosures

The authors have no conflicts of interest to disclose.

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Supplementary Material

To access the supplementary material accompanying this article, visit *CJC Open* at https://www.cjcopen.ca/ and at https://doi.org/10.1016/j.cjco.2019.05.005.