

Delayed Left Main Coronary Artery Obstruction After Radiofrequency-Induced Coronary Dissection and Spasm



Insights From Optical Frequency-Domain Imaging and Intravascular Ultrasound Imaging

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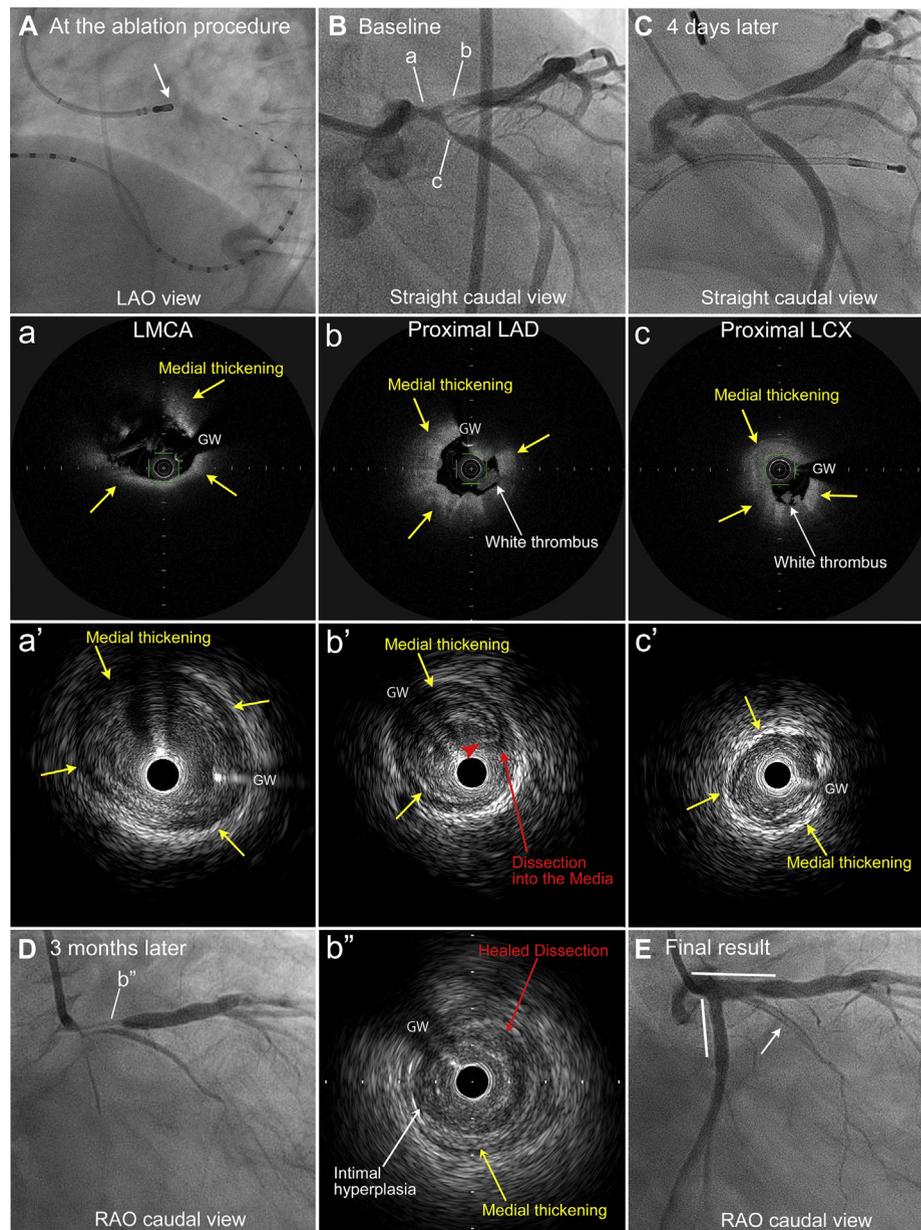
A 70-year-old woman underwent second radiofrequency ablation at the left coronary cusp for recurrent and drug-refractory premature ventricular contractions arising from the left coronary cusp. Pre-procedural coronary angiography showed no stenosis in either coronary artery. Radiofrequency energy application (30 W/50°C/30 s) with an open-irrigated catheter resulted in premature ventricular contraction suppression (**Figure 1A**). No catheter insertion into the left main coronary artery (LMCA) was observed during ablation. However, the patient suddenly developed severe hypotension and escaped junctional rhythm. Angiography revealed an acute critical true bifurcation lesion in the LMCA (**Figure 1B**). Optical frequency-domain imaging (LUNAWAVE, Terumo, Tokyo, Japan) demonstrated significant medial thickening, suggestive of severe coronary spasm (**Figures 1A to 1C**, **Online Video 1**). Furthermore, intravascular ultrasound (IVUS) revealed acute dissection into the media in the proximal left anterior descending artery, in addition to medial thickening (**Figures 1a' to 1c'**, **Online Video 2**). After repeated intracoronary injections of nitroglycerin and intra-aortic balloon pump insertion, the patient gained hemodynamic stability. She was

managed medically with nifedipine, isosorbide mononitrate, pravastatin, and aspirin. Angiography at 4 days post-operatively showed improvement in the LMCA lesion with Thrombolysis in Myocardial Infarction flow grade 3 (**Figure 1C**). Although localized acute coronary dissection had been detected on baseline IVUS, substantial improvement of the coronary spasm was confirmed under medical therapy with TIMI flow grade 3 on a repeat angiogram. Therefore, she had been treated medically. However, 3 months later, she developed non-ST-segment elevation myocardial infarction and cardiogenic shock due to total occlusion in the LMCA (**Figure 1D**). High-definition 60-MHz IVUS (Alta View, Terumo) demonstrated a persistent medial thickening covered with homogeneous intimal hyperplasia and healed dissection (**Figure 1b'**, **Online Video 3**). Bifurcation reconstruction with 2 drug-eluting stents was successfully performed (**Figure 1E**).

This is the first report demonstrating acute coronary dissection into the media, in addition to severe spasm, as the primary mechanism of radiofrequency-induced coronary artery injury, successfully demonstrated by IVUS and optical frequency-domain imaging (1). Acute coronary

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FIGURE 1 Angiography, IVUS, and OFDI Assessment of the Coronary Artery Dissection and Spasm After Radiofrequency Ablation

(A) Radiofrequency ablation was performed at the left coronary cusp (LCC) for recurrent premature ventricular contraction. The **white arrow** shows the tip of the ablation catheter. **(B)** Coronary angiography revealed subocclusive stenosis of the distal left main coronary artery (LMCA) bifurcation, involving the left anterior descending artery (LAD) and the left circumflex artery (LCX) ostium. **(a-c)** Optical frequency-domain imaging (OFDI) ([Online Video 1](#)) and **(a'-c')** intravascular ultrasound (IVUS) images ([Online Video 2](#)) demonstrated severe medial thickening (**yellow arrows**), causing luminal compromise and white thrombus (**white arrow**). **(b')** IVUS image of LAD revealed propagation of the coronary dissection into the media (**red arrow**). The **red arrowhead** denotes the mobile flap. **(C)** Angiography taken 4 days post-operatively showed improvement in the LMCA lesion. **(D)** Emergent angiography obtained 3 months later showed total occlusion in the LMCA. **(b'')** High-definition 60-MHz IVUS demonstrated persistent medial thickening (**yellow arrow**) covered with homogeneous intimal hyperplasia (**white arrow**) and mixed thrombus at the occluded proximal LAD lesion. The **red arrow** denotes previously dissected part, namely chronic healed dissection ([Online Video 3](#)). **(E)** Excellent angiographic results were obtained after the bifurcation reconstruction with modified T stenting. The **white line** shows the location of the implanted stents. The **white arrow** shows coronary dissection induced by kissing balloon dilatation in the first obtuse margin. The **(a-c)** OFDI and **(a'-c')** IVUS images at baseline and **(b'')** IVUS image 3 months later correspond to each other. GW = guidewire; RAO = right anterior oblique.

dissection and spasm led to residual medial thickening with gradual reorganization and intimal hyperplasia, and finally to delayed LMCA obstruction. This case also highlights the importance of bailout stenting in the setting of radiofrequency-induced coronary artery injury.

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 **APPENDIX** For supplemental videos and their legends, please see the online version of this article.