

## IMAGES IN INTERVENTION

# In-Stent Neointimal Proliferation

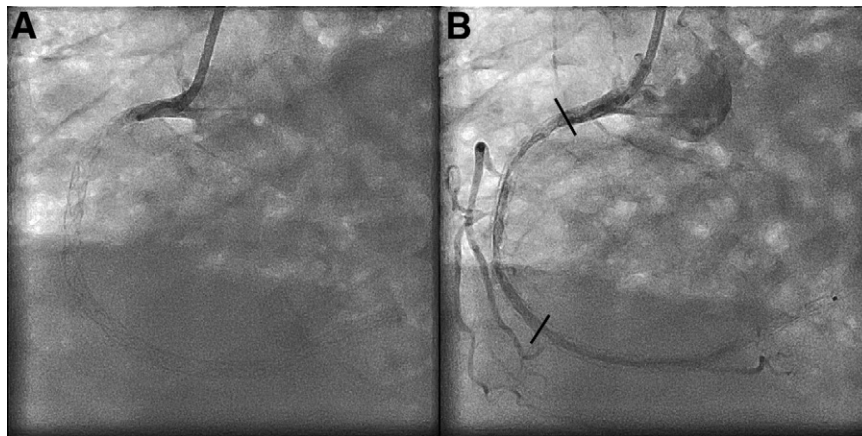
## A Cause of Late Stent Thrombosis in a Patient With “Full Metal Jacket” 15 Years After Implantation: Insights From Optical Coherence Tomography

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A 62-year-old man presented with inferior ST-segment elevation myocardial infarction for primary percutaneous coronary intervention. He had a history of myocardial infarction 15 years ago and had a bare-metal stent implanted in the right coronary artery. Upon presentation, coronary angiography revealed total occlusion of the right coronary artery, which was covered at its full length with stents (Fig. 1A). We performed thrombus aspiration with partial restoration of antegrade flow (Fig. 1B) and proceeded with optical coherence tomography imaging of the vessel.

Optical coherence tomography (Fig. 2, Online Video 1) revealed a highly heterogeneous tissue coverage, presenting with several features that resemble native atherosclerosis, such as calcific depositions and thin-cap fibroatheroma (1,2). A rupture was detected in the neointima with mural thrombus at the rupture site protruding into the lumen. The neointima had high variability across the stent demonstrating different patterns of coverage (3), as well as a peristrut low-intensity area, reported to correspond to areas of fibrin accumulation (4). Although, there have been pathological reports demonstrating growth of de novo

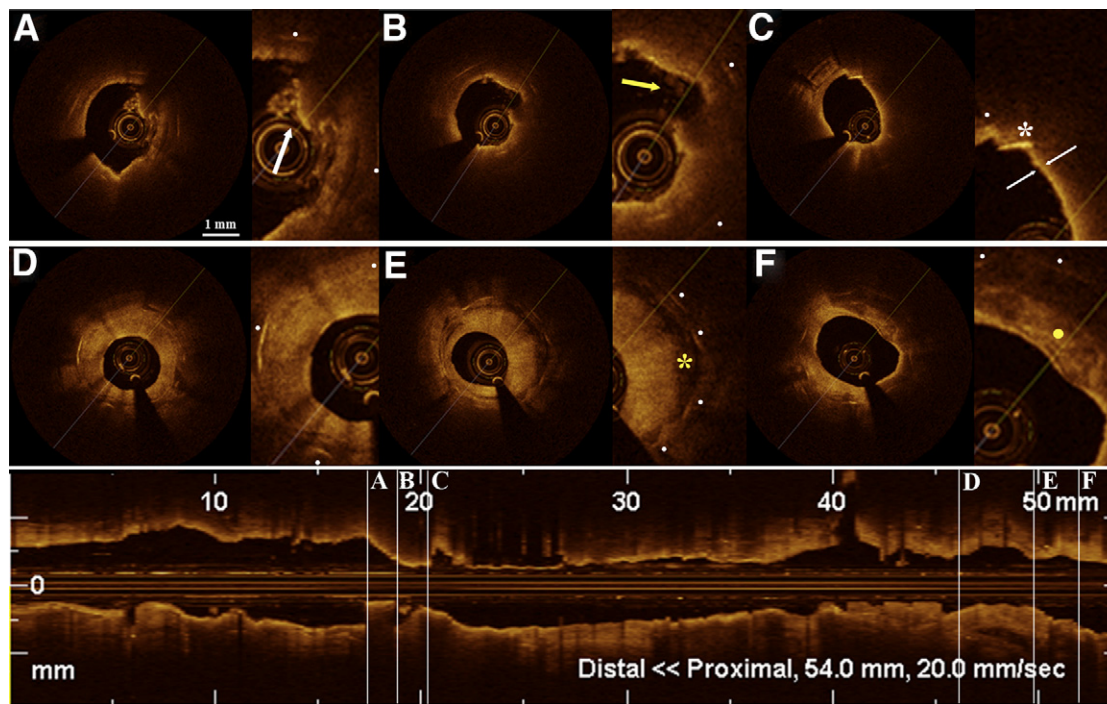


**Figure 1. Coronary Angiography of the Right Coronary Artery Pre-and Post-Manual Thrombus Aspiration**

(A) Pre- and (B) post-manual thrombus aspiration. **Black lines** indicate optical coherence tomography pullback.

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Manuscript received February 9, 2012, accepted February 18, 2012.



**Figure 2.** Optical Coherence Tomography Cross-Sectional Images With Magnification and L-Mode Reconstruction

**White dots** mark the stent struts. (A) Neointimal rupture with mural thrombus protrusion (**white arrow**). (B) Neointimal rupture (**yellow arrow**). (C) Layered pattern consistent with thin-cap fibroatheroma (cap thickness: 40  $\mu\text{m}$ ) with high-intensity signal, possibly corresponding to macrophage infiltration or cholesterol crystal protrusion (**white asterisk**). (D) Heterogeneous pattern of tissue coverage. (E) Homogeneous pattern of tissue coverage with peristrut low-intensity area (**yellow asterisk**). (F) Layered pattern consistent with fibrocalcific plaque (**yellow dot**).

atheromatic tissue inside stents (1), now with optical coherence tomography, it is feasible to unravel the complexity of this entity *in vivo*, as well as the mechanisms of thrombus formations in such cases.

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#### REFERENCES

1. Inoue K, Abe K, Ando K, et al. Pathological analyses of long-term intracoronary Palmaz-Schatz stenting; is its efficacy permanent? *Cardiovasc Pathol* 2004;13:109-15.
2. Kang SJ, Mintz GS, Akasaka T, et al. Optical coherence tomographic analysis of in-stent neoatherosclerosis after drug-eluting stent implantation. *Circulation* 2011;123:2954-63.
3. Gonzalo N, Serruys PW, Okamura T, et al. Optical coherence tomography patterns of stent restenosis. *Am Heart J* 2009;158:284-93.
4. Otake H, Shite J, Ikeno F, et al. Evaluation of the peri-strut low intensity area following sirolimus- and paclitaxel-eluting stents implantation: insights from an optical coherence tomography study in humans. *Int J Cardiol* 2010;157:38-42.