In-Stent Thin-Cap Fibroatheroma After Drug-Eluting Stent Implantation

Ex-Vivo Evaluation of Optical Coherence Tomography and Intracoronary Angioscopy

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A 57-year-old man died of sepsis, and an autopsy was performed. Previously, he had undergone percutaneous coronary intervention of the middle left anterior descending coronary artery, with 2 sirolimus-eluting stents implanted 61 months before death. Post-mortem ex-vivo optical coherence tomography (OCT) (LightLab imaging, Westford, Massachusetts), coronary angioscopy (CAS) (FiberTech, Tokyo, Japan) imaging, and pathological examination were performed in the stented segments. OCT...

Figure 1. Histopathology and Intravascular Images of In-Stent TCFA

(A) A cross-sectional image of optical coherence tomography clearly showed an eccentric intimal growth with the appearance of rapid attenuation of the signals (asterisks) with a diffuse border. The signal-poor area was located inside the stent struts (arrows). In this cross section, the stent struts behind the signal-poor mass (6 to 9 o’clock) were completely invisible because of attenuation of the signal, and the thickness of the fibrous cap overlying the signal-poor area was 60 μm by optical coherence tomography image. (B) Coronary angioscopy revealed intensive yellow plaque, and there were no visible stent struts. (C) Corresponding histology from the same section of the lesion in A showed a thin fibrous cap overlying a large, lipid-rich, eccentric necrotic core, indicating a TCFA-like appearance within the stent. (Hematoxylin and eosin stain, scale bar = 1 mm, allows the identification of stent struts.) Minimal thickness of the fibrous cap by histology was 52 μm. (D) Higher magnification of the neointima within the stent struts demonstrated necrotic debris with cholesterol clefts. The thin fibrous cap was infiltrated by lipid-laden macrophages. (Hematoxylin and eosin stain, scale bar = 500 μm, allows the identification of the stent struts.) TCFA = thin-cap fibroatheroma.
images showed in-stent eccentric intimal growth of moderate intimal hyperplasia with rapid attenuation of the signals with diffuse border, such as a thin-cap fibroatheroma (TCFA) in native coronary arteries (Fig. 1A). Corresponding CAS images revealed that stent struts were covered by intensive yellow neointima (Fig. 1B). Corresponding histopathologic images demonstrated a large, lipid-rich necrotic core covered with a thin fibrous cap infiltrated by lipid-laden macrophages with few smooth muscle cells (Figs. 1C and 1D).

Discussion

Based on recent pathological study, rupture of a TCFA-like lesion within the neointima has been reported in the long term after stent implantation and has been proposed to be responsible for very late stent thrombosis (1). To the best of our knowledge, this is the first case of ex-vivo interrogation of in-stent TCFA containing neointima after drug-eluting stent implantation with OCT and CAS by autopsy specimen. On OCT images, the lipid-rich necrotic core appears as a low-signal-intensity mass because of the strong optical absorption and scattering of lipids at light wavelengths around 1,000 nm (2). Therefore, stent struts cannot be visualized by OCT if there is a lipid-rich necrotic core within the neointima. On the other hand, stent struts behind organized fibrin thrombus can be visualized because OCT signals are not attenuated by this material (3).

Therefore, it is important to identify the in-stent TCFA-like neointima whether stent struts behind a low-signal-intensity area are “visible” or “invisible.”

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REFERENCES


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