We present a case of imaged “intracoronary whirling current phenomenon.” A 60-year-old Japanese man was treated with 2 sirolimus-eluting stents (SES; 3.0×18 and 3.5×33 mm) in the right coronary artery (RCA) for chronic total occlusion in October 2007. After percutaneous coronary intervention, he was taking 200 mg of aspirin and 200 mg of ticlopidine. However, he had recurrent transient ischemic chest pain beginning at 7 months. A second coronary angiography at 8 months after SES implantation showed reocclusion at a site just proximal to the SES. A repeat percutaneous coronary intervention was performed for RCA chronic total occlusion (Figure 1). After crossing the guide wire to the distal portion of the RCA, the target lesion was dilated using a 1.25×10 mm balloon catheter. After minimum balloon dilatation, optical coherence tomography (OCT) was performed to evaluate in-stent reocclusion from the distal portion to the proximal portion (Figure 2). Two different types of tissue coverage (may be consistent with thrombus formations of different ages) were observed in the stent reocclusion. Moreover, in the patent distal portion of the RCA, an intracoronary whirling current phenomenon image was observed on OCT, suspected to be a partial red thrombosis formation combined with stagnation coronary flow in the distal stent (Figures 2 and 3 and Video 1). Optical coherence tomography images were processed and analyzed with NIH Image J (National Institutes of Health, Bethesda, Md). The 1/2 attenuation width of the signal intensity curve was 65 μm for the distal thrombus-like image (compatible with red thrombus; Figure 4). The proximal thrombus-like lesion may have been a mixed thrombus combined with fibrin clot (Figure 3 and Videos 2 and 3). The 1/2 attenuation width of the signal intensity curve was 270 μm for the proximal thrombus-like image (compatible with nearly white thrombus; Figure 4). These tissue images were suspected to be movable protrusive thrombi with intravascular ultrasound after dilatation using a 3.25×15 mm balloon (Figure 5 and Video 4). Moreover, a partial thin membrane structure looked like a thin fibrous cap that was observed in the reoccluded thrombotic tissue (Figure 2). This thin cap may have been a fibrin membrane. Finally, 2 paclitaxel-eluting stents (3.5×32 mm, combined with 3.5×32 mm) were successfully implanted in the target lesion without complication.

Fujii et al reported that chronic thrombus formation is one of the causes of in-SES restenosis. The intracoronary whirling current phenomenon at the distal portion indicates collateral flow from the left coronary artery to the RCA. This image revealed competing flow between the antegrade and collateral flow. Moreover, this image may be a prestage of thrombus formation (gel state; rouleaux formation) or aggregation of red blood cells, such as stagnate flow in the atrium. A well-developed collateral system is not a major cause of reocclusion of chronic total occlusion. However, this OCT image may show the stagnant coronary artery flow from collaterals, and, thus, may represent increased thrombogenicity at the distal site of total occlusion after reocclusion.
Acknowledgments

We thank Dr T. Akasaka (Division of Cardiology, Wakayama Medical University) for assistance with assessment of thrombosis by the OCT system.

Disclosures

None.

References


Key Words: thrombosis ■ stents ■ coronary imaging ■ coronary circulation
Figure 3. High-power field image of OCT. A, Proximal large mixed thrombus-like tissue with partial tissue coverage. B, Tail of proximal thrombus-like formation in the intracoronary lumen at the mid portion of in-stent. C and D, Partial thin-membrane structure that looked like a thin fibrous cap was observed in the reoccluded thrombotic tissue. This thin cap may have been a fibrin membrane. The thin cap thickness was 40 μm. E and F, Another distal thrombus-like image tied together with whirling current image. The 1/2 attenuation width of the signal intensity curve was 147 μm for the upper thrombus-like image (compatible with red thrombus; blue allow).
Figure 4. The 1/2 attenuation width of the signal intensity curve was 65 μm for the distal thrombus-like image (compatible with red thrombus) and 270 μm for the proximal thrombus-like image (compatible with nearly white thrombus).

Figure 5. These tissue images were suspected movable protrusious thrombus with intravascular ultrasound after dilatation using a 3.25×15 mm balloon. These tissues are floating masses and came off from in-stent lumen and movable (allows, Video 4).
"Intracoronary Whirling Current Phenomenon" and Thrombus Formation After Sirolimus-Eluting Stent Implantation Visualized by Optical Coherence Tomography
Tomonori Itoh, Tetsuya Fusazaki, Takumi Kimura, Yoshinobu Ogino, Hiroki Matsui, Shoma Sugawara, Iwao Goto and Motoyuki Nakamura

doi: 10.1161/CIRCINTERVENTIONS.108.813881
Circulation: Cardiovascular Interventions is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2009 American Heart Association, Inc. All rights reserved.
Print ISSN: 1941-7640. Online ISSN: 1941-7632

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://circinterventions.ahajournals.org/content/2/3/264

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Circulation: Cardiovascular Interventions can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Circulation: Cardiovascular Interventions is online at:
http://circinterventions.ahajournals.org//subscriptions/