To the Editor: Presently, occurrence of late stent thrombosis (LST) after drug-eluting stent implantation is a major clinical concern. Although LST is an infrequent complication, LST can lead to serious results. A long-term follow-up study revealed recently that LST occurs at a constant rate of 0.6%/year for up to 3 years after drug-eluting stent implantation (1). Regarding pathological considerations, a delayed arterial healing characterized by incomplete endothelialization and persistence of fibrin plays a key role in the occurrence of LST. Moreover, the best morphometric predictor of LST after drug-eluting stent implantation is a ratio of uncovered struts to total struts/section of 0.3 (2). Therefore, we hypothesized that the uncovered struts of sirolimus-eluting stent (SES) remain for an extended period of time.

Optical coherence tomography (OCT) with high-resolution images (approximately 10 μm) can clearly distinguish thin neointimal hyperplasia (NIH) on stent struts and uncovered struts (3). To date, no long-term OCT follow-up data after SES implantation are available. The present OCT examinations focused on the frequency of uncovered struts of the SES at 2-year follow-up.

Between February 2007 and May 2007, 2-year angiographic and OCT follow-up examinations after SES (Cypher, Cordis Corp., Miami Lakes, Florida) implantation were performed for 21 segments in 21 patients (age 64 ± 10 years, 18 male). During this study period, clopidogrel had not been approved for clinical use in Japan.

The OCT procedure has been previously reported (3). Cross-sectional OCT images were analyzed at intervals of 1 mm. Thickness of NIH inside all struts was measured, and thickness = 0 μm was defined as uncovered. Uncovered strut ratio in each cross-section was calculated as uncovered strut(s)/total struts (Fig. 1). In-stent thrombus was defined as an irregular mass protruding into the lumen that had dimension ≥250 μm at its thickest point. Continuous data are presented as mean ± SD. Fisher exact test or unpaired t test was used for statistical analysis.

In 485 cross-sectional images, 3,707 struts were identified. Thickness of NIH was 71 ± 93 μm. Frequency of uncovered struts was 5% (range 0% to 12%/patient). In the bifurcations, of the 39 struts located in the orifice of side branches 4 (10%) were uncovered. In the overlapping segments, 19 of 286 (7%) struts were uncovered. Prevalence of patients who had any uncovered struts was 81%. Uncovered strut ratio/patient ranged from 0 to 0.43. Frequency of cross-section(s) with uncovered strut ratio >0.3 was 2%. Concerning these cross-sections, 2 were in the overlapping segments and none was in the bifurcation. Prevalence of patients who had any cross-sections with uncovered strut ratio >0.3 was 38% (Fig. 2).

The OCT identified 3 thrombi in 3 patients. There were no abnormal findings on coronary angiograms. None of these cases showed any clinical thrombus-related events. Among these patients, 2 received dual antiplatelet therapy and another patient was prescribed aspirin monotherapy. Uncovered struts or cross-sections with uncovered strut ratio >0.3 were recognized in 1 patient.

In our series, 2% of the uncovered struts in 81% of the patients still remained 2 years after SES implantation. These frequencies were higher than in bare metal stents (0.1% of the struts in 7% of the patients; Takano et al., unpublished data). Moreover, 38% of the patients had the cross-section of uncovered strut ratio >0.3, the most powerful pathological predictor of LST. However, no thrombotic events occurred in any patient. There was a possibility that existence of these cross-sections was not an absolute condition but a necessary condition for the occurrence of LST. In other words, under the condition of existence of these poorly covered
In conclusion, long-term follow-up OCT examination demonstrated that few uncovered struts remained in the majority of the patients for up to 2 years after SES implantation. Further careful follow-up might be required.

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REFERENCES

Letters to the Editor

T-Wave Alternans and Intraventricular Conduction Delays

I read with great interest the study by Cantillon et al. (1) on the utility of microvolt T-wave alternans (MTWA) in predicting total mortality and arrhythmia-free survival in patients with a left ventricular ejection fraction \( \leq 30\% \) who had been referred for invasive electrophysiological testing for evaluation of syncope and/or nonsustained ventricular tachycardia. It is not clear to this reader whether this report’s database derives from the one employed in another study, emanating from the same laboratory, and published in another journal on the same month as the present study (2). However, even if this is the case, the present study provides an opportunity to evaluate the influence of the QRS duration on the magnitude of the MTWA. The authors in both studies (1,2) employed the traditional threshold of \( \geq 1.9 \) \( \mu V \), derived from the spectral analysis of the signal, to characterize an