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Peri-Strut Low Intensity Areas Identified by Optical Coherence Correlated with the Degree of Neointimal Formation After 3 Years Following Stent Implantation in Humans

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Background: Different long term healing patterns are frequently observed with Optical Coherence Tomography (OCT) following stent implantation. Although some of these findings seem to suggest abnormal healing, the clinical implications of these findings are still unknown.
Methods: A total of 99 patients in whom a stent was implanted (total of 125 stents, 32 bare metal stents (BMS), 30 paclitaxel-eluting stents (PES), and 63 sirolimus-eluting stents (SES)) were followed with angiography and OCT beyond 3 years (average=4.9±2.1 years). Strut by strut analysis was performed in 3,053 cross-sectional images yielding to a total of 30,302 analyzable images. Peri-strut Low Intensity (PLI) images were defined as the presence of homogenous low intensity area around a stent strut without significant signal attenuation behind the area. The severity of PLI was assessed by quantifying the number and degree of PLI features in all analyzable imaging frames.
Results: PLI presence was found in 19.4% of BMS, 12.6% of PES, and 6.0% of SES struts ($p<0.001$). The mean neointimal thickness on struts with PLI was significantly higher than that without PLI regardless of the stent type (BMS= 0.62±0.30 versus 0.29±0.18 mm; PES=0.47±0.27 versus 0.19±0.18 mm; SES=0.56±0.31 versus 0.14±0.15 mm; $p<0.001$). The severity of PLI correlated with the neointimal area and also with angiographical late loss in all stent types ($r=0.407$ to 0.846, $p<0.05$). The severity of PLI correlated with angiographical binary restenosis even after adjustment with neointimal area in all stent types (odds ratio=9.785 to 34.72, $p<0.05$).
Conclusions: The presence of PLI in neointima appears to correlate with the severity of neointimal proliferation in the late phases of stent healing. The clinical implications of these findings need further investigation.

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Evaluation of Coronary Arterial Calcification using ex-vivo imaging by Optical Frequency Domain Imaging

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Background: Optical frequency domain imaging (OFDI) can delineate calcified plaque whereas intravascular ultrasound has limited visualization of depth of calcification. The aim of this study was to evaluate the ability of OFDI to quantify and qualify calcification using ex-vivo imaging with autopsy cases.
Methods: Eighty nine coronary segments from 11 cadavers received ex-vivo imaging by OFDI. Thirty four matched segments had calcified plaques where the comparison between OFDI images and histology had performed. The thickness of calcification was measured both in OFDI and histology. Additionally, the existence of lipid components (lipid pool or necrotic core) behind or adjacent to calcification were recorded by histological examinations.
Results: There was a good correlation in the thickness of calcification between OFDI and histology (R-square=0.61, $p<0.0001$), however, this was not true when the lipid components exist behind or adjacent to calcification (R¬-square=0.083953, p=0.4495). The calcification with clear border in outer layer had significantly less lipid components as compared to those with attenuation (35% vs 88%, $p<0.0001$).
Conclusions: OFDI has a potential ability to detect and characterize coronary arterial calcification, however the extent of calcification could be underestimated when the lipid components exists adjacent to calcification.

TCT-257

Angioscopy Study From a Large Patient Population Comparing Sirolimus-Eluting Stent With Biodegradable Versus Durable Polymer

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Background: This study aimed to compare the neointimal coverage (NIC), thrombus, color of plaque underneath the stent at 9-month after implantation of sirolimus-eluting stent (SES) either with durable or with biodegradable polymer (BDPM).
Methods: A total of 175 patients were assigned as Cypher (n=81) and Excel (n=94, with BDPM) stent at 9-month after indexed procedure. NIC was classified from Grade 0-3. Color of plaque was divided into white, light-yellow, yellow and dark yellow. Thrombus was diagnosed as material with cotton-like or ragged appearance. Incomplete NIC (Grade 0/1) circled by a blush was termed by “inflaming”.
Results: More patients in Excel group had unstable angina, previous myocardial infarction, less silent ischemia, and decreased left ventricular eject fraction compared to Cypher group. The minimal- and maximal-NIC grades in the Cypher group were 0.67±0.58 and 2.29±0.46, respectively, compared to 1.45±0.67 ($p<0.001$) and 2.64±0.49 (p=0.023) in the Excel group. The percentage of yellow plaque, thrombus, “inflaming” and NIC grade of 0 in the Excel and Cypher groups, respectively, were as follow: 8.0% vs. 26.8% (p=0.031), 9.8% vs. 32.9% (p=0.024), 8.0% vs. 38.1% (p=0.017) and 38.1% vs. 0% ($p<0.001$). Of the stents with “inflaming”, 63.6% had thrombus compared to 20.1% of the non-inflaming stents ($p<0.001$). Overlapping segments had the lowest NIC grades and more “inflaming” demonstrating a significant difference between two groups. NIC grade was positively correlated with thrombus.
Conclusions: SES with BDPM has improved NIC resulting in less yellow plaque, thrombus and “inflaming”. Overlapping segments had the lowest NIC grade and more “inflaming”.

Table 4. Angioscopic findings at 9 months

	Cypher (N=97)	Excel (N=112)	*p*
No. stented vessels (n)	1.34 ± 0.21	1.34 ± 0.22	1.000
Minor NIC (grade 0-3)	0.67 ± 0.58	1.45 ± 0.67	<0.001
Grade 0, % (n)	38.1 (37)	0 (0)	<0.001
Grade 1, % (n)	58.8 (57)	41.1 (46)	0.243
Grade 2-3, % (n)	3.1 (3)	58.9 (66)	<0.001
Maximal NIC (grade 0-3)	2.29 ± 0.46	2.64 ± 0.49	0.023
Yellow plaque, % (n)	26.8 (26)	8.0 (9)	0.031
Thrombus, % (n)	32.9 (32)	9.8 (11)	0.024
Inflaming, % (n)	38.1 (37)	8.0 (9)	0.017
Stent overlapped, % (n)	11.3 (11)	10.7 (12)	0.733
Minor NIC (grade 0-1)	0.36 ± 0.30	1.08 ± 0.79	0.018
Maximal NIC (grade 2-3)	2.09 ± 0.30	2.17 ± 0.58	0.701
Yellow plaque, % (n)	45.5 (5)	50.0 (6)	0.718
Thrombus, % (n)	72.7 (8)	75.0 (9)	0.531
Inflaming, % (n)	50.0 (4)	22.2 (2)	<0.001

DAPT, dual antiplatelet therapy; NIC, neointim coverage; ST, stent thrombosis;

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Impact of the type of the underlying plaque on the neointima tissue developed after a bioresorbable scaffold implantation. A serial optical coherence tomography study

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Background: It has been demonstrated that after the deployment of a bioresorbable scaffold (BRS) a thick fibromuscular tissue develops that covers the vessel wall. However the effect of the composition of the plaque on neointimal proliferation remains unclear.
Methods: We analyzed data from 20 patients who were treated with a BRS and had optical coherence tomography (OCT) at baseline, at 6 months and at 2 years follow-up. Two experts identified the circumferential location of the lipid and calcific tissue in the OCT data and measured the thickness of the overlaying tissue. This information was used to construct spread out vessel plots that allowed comprehensive visualization of the the spatial location of the plaque components (Figure: the red color corresponds to lipid the white to calcific and the green to fibrous tissue). The extent of each plaque component was expressed as percentage of the total plaque.

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