**TCT-360**

Impact of Tissue Protrusion Assessed by Optical Coherence Tomography on Early Stent Thrombosis in Patients with ST Elevation Myocardial Infarction

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**BACKGROUND** The efficacy of stenting have been established in patients undergoing primary percutaneous coronary intervention (PCI) for ST-segment elevation myocardial infarction (STEMI). However, early stent thrombosis in STEMI patients remains a clinical problem. We used optical coherence tomography (OCT) to assess the impact of abnormal findings after stent implantation such as tissue protrusions and stent malapposition on early stent thrombosis in patients with primary PCI for STEMI.

**METHODS** We studied 110 patients, including 9 with early stent thrombosis after primary PCI for STEMI.

**RESULTS** Although minimum stent area was similar between 2 groups (6.73 ± 1.89 mm² vs. 6.80 ± 1.95 mm², p = 0.695), minimum lumen area within stent was significantly smaller in the early stent thrombosis group (5.35 ± 1.51 mm² vs. 5.82 ± 1.92 mm², p = 0.037). Maximum acute stent malapposition area was similar between 2 groups (0.92 ± 1.21 mm² vs. 0.88 ± 1.35 mm², p = 0.725). Maximum tissue protrusion area was significantly larger in the early stent thrombosis group (2.55 ± 1.37 mm² vs. 1.04 ± 0.92 mm², p < 0.01).

**CONCLUSIONS** Larger tissue protrusion but not acute malapposition after stent implantation were related to early thrombosis after primary PCI for STEMI.

**CATEGORIES IMAGING:** Intravascular

**KEYWORDS** OCT, ST-segment elevation myocardial infarction, acute, stent thrombosis

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**TCT-361**

Combined use of intravascular ultrasound and optical coherence tomography during percutaneous coronary intervention may reduce target lesion revascularization after percutaneous coronary intervention

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**BACKGROUND** The clinical utility of invasive imaging guidance for percutaneous coronary intervention (PCI) has been repeatedly reported. Little is known, however, about whether the combined use of intravascular ultrasound (IVUS) and optical coherence tomography (OCT) during PCI may offer long-term clinical benefit as compared with PCI performed under single modality-guidance.

**METHODS** From the Kobe university OCT registry, we enrolled a total of 222 lesions (241 patients) who underwent mid-term follow-up OCT (6-12 months). Then, we classified them into 3 groups according to the type of imaging device used for the index procedure: IVUS-guided group; n = 160, OCT-guided group: n = 53, Combination group (both IVUS and OCT were used): n = 108. Long-term clinical follow-up was performed to evaluate target lesion revascularization (TLR) for the average duration of 27.9 ± 17.7 months after stenting.

**RESULTS** Baseline patient and lesion characteristics showed that Combination group had a significantly larger percentage of stable angina patients and shorter stent length as compared with other groups. Otherwise, there was no statistical difference among the groups. Mid-term follow-up OCT analysis showed that Combination group had a tendency toward larger minimum stent area than the other groups (IVUS: 5.53 ± 1.96 mm², OCT: 5.23 ± 1.70 mm², Combination: 5.90 ± 2.15 mm²; p = 0.11, respectively) without a significant difference in stent edge dissection and residual stenosis. Also, Combination group had a significantly larger minimum lumen area than other two groups (IVUS: 4.36 ± 1.86 mm², OCT: 4.30 ± 1.87 mm², Combination: 4.93 ± 2.27 mm²; p = 0.05). Among these patients population, TLR was observed in 30 lesions. The incidence of TLR in the combination group was significantly lower than that in the IVUS or OCT group (10.6% vs. 17.0% vs. 3.7%, P = 0.02, respectively). After adjusting confounding parameters, multivariate logistic regression analysis showed that, in addition to statin use, and BMS use, the combined use of IVUS and OCT was independently associated with less incidence of TLR (OR 0.225, p = 0.014).

**CONCLUSIONS** Combined use of IVUS and OCT during PCI may offer clinical benefit after PCI as compared with a single use of such modalities. This beneficial effect is probably afforded by appropriate stent sizing and optimal stent expansion based on the detailed lesion assessment during PCI.

**CATEGORIES IMAGING:** Intravascular

**KEYWORDS** IVUS, OCT, Target lesion revascularization

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**TCT-362**

Assessment of Bioresorbable Scaffold With a Novel High-Definition 60MHz IVUS Imaging System: Comparison With Conventional 40MHz IVUS and Optical Coherence Tomography

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**BACKGROUND** The novel 60MHz High-Definition IVUS (HD-IVUS) has been shown to be superior to conventional 40MHz IVUS in plaque evaluation with advantages of IVUS over optical coherence tomography (OCT) in entire vessel wall assessment without the need for blood removal during imaging. Its higher image acquisition rate also enables high-speed pullback imaging to reduce procedural time. This study aimed to evaluate the feasibility of 60MHz HD-IVUS with conventional and high-speed pullbacks in qualitative and quantitative assessment of bioresorbable scaffold (BRS) as compared with 40MHz IVUS and OCT.

**METHODS** In this in vivo swine study, scaffold area, incomplete strut apposition (ISA) and strut fracture were independently analyzed with the 3 modalities in 59 matched cross-sections from 2 BRS (3.0x18 mm and 3.5x12 mm) deployed in the coronary arteries (left anterior descending and right coronary arteries). To evaluate the scaffold ISA, each BRS was deployed at nominal pressure in an arterial segment slightly larger than the nominal device size. Each BRS was then over-dilated at high pressure to create strut fractures. Using motorized pullback, HD-IVUS imaging was performed at 0.5 mm/s and was repeated at 10 mm/s. In each modality, strut fracture was identified as discontinuity of the scaffold struts.
RESULTS In scaffold area measurements, 60MHz HD-IVUS showed an excellent correlation with OCT, demonstrating a slightly higher correlation coefficient compared to conventional 40MHz IVUS (Figure 1). Scaffold ISA was identified by OCT in 14 cross-sections; 11 of them were also detected by 60MHz HD-IVUS. In contrast, 40MHz IVUS detected only 2 ISA sites, attributable to unclear images of BRS struts and/or blood speckles behind the ISA struts (Figure 2). Strut fracture was identified by OCT in 2 cross-sections; all of them were clearly detected by 60MHz HD-IVUS, while 40MHz IVUS showed ambiguous detection of this entity (Figure 3). These findings were also confirmed on high-speed pullback images of 60MHz HD-IVUS.

CONCLUSIONS The 60MHz HD-IVUS is superior to conventional 40MHz IVUS in both quantitative and qualitative evaluation of BRS without the need for blood removal from the imaging field. Our findings suggest the novel 60MHz HD-IVUS as a well-balanced clinical imaging system with respect to image resolution, signal penetration and ease of image acquisition procedure.

CATEGORIES IMAGING: Intravascular

KEYWORDS Bioresorbable scaffold, Imaging technology, Malapposition

TCT-364

Increased Lipid Content, Macrophage Infiltration And Neovascularization in Culprit Coronary Lesions of Patients With Chronic Kidney Disease

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BACKGROUND Chronic kidney disease is an independent risk factor for adverse coronary events. Pathological studies suggest a unique high-risk atherosclerotic phenotype in such patients. Concor-dant data using in-vivo, high-resolution intravascular imaging with optical coherence tomography, however, remains limited. OCT with its high resolution (20 μm) is capable to accurately identify macrophage content and microvessels in coronary plaques. The aim of this study was to characterize the differences in coronary atherosclerotic culprit lesions in patients with versus without chronic kidney disease (CKD) Using Optical Coherence Tomography (OCT).

METHODS We analyzed 380 culprit lesions from 380 patients from Mount Sinai Hospital (MSH) optical coherence tomography imaging database. Estimated glomerular filtration rate (eGFR) was calculated using Modification of Diet in Renal Disease formula (MDRD) and CKD was defined as an eGFR of <60 ml/min/1.73m2. OCT was performed in patients undergoing catheterization of culprit lesion. Images were analyzed systematically at 1 mm intervals according to previously validated criteria using St. Jude Medical Offline Review Workstation.

RESULTS Compared to patients without (n=317, mean eGFR 88.7 ± 23.6) those with (n=63, mean eGFR 50.3 ± 9.3) CKD were older, more often males with a greater burden of hypertension and dyslipidemia as published in previous studies. CKD lesions had significantly longer lipid pools (6.97 ± 5.67 vs 3.58 ± 4.63mm p = 0.018), increased macrophages (81% vs 85% p = 0.009) as well as a trend to higher microvessels (59% vs 45% p = 0.051). However, Fibrous cap thickness and TCFA were not significantly different between the two groups.

CONCLUSIONS Using OCT we demonstrate that even mild renal impairment is associated with several pathological determinants of plaque vulnerability, such as plaque inflammation and neo-vascularization. These findings might contribute to atherosclerosis and plaque rupture and thus increased cardiovascular risk in patients with CKD.

CATEGORIES IMAGING: Intravascular

KEYWORDS Chronic kidney disease, Coronary artery disease, Optical coherence tomography

TCT-364

Quantification Of Intracoronary Plaque Burden And Longitudinal Comparison After Elective PCI: Implementation Of A Novel 3-Dimensional OCT Plaque Analysis Algorithm

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BACKGROUND Optical coherence tomography (OCT) allows precise evaluation of coronary structures. There is limited knowledge whether plaque burden plays a role in coronary healing response, or is susceptible to antiproliferative drugs or stents after PCI. We aimed to implement a 3-dimensional OCT algorithm to analyze and quantify atherosclerotic plaques in stented vessel segments. Furthermore, we investigated intracoronary plaque burden among two different stent types and at two different time points.

METHODS 52 de-novo lesions in 43 patients (N = 35 males, 69.7 ± 7.6 yrs) with stable CAD were treated with stent implantation (BMS or DES). Six-month OCT analysis was available in 44 lesions, and earlier 2-month OCT f/u in 16 lesions. A novel, 3-dimensional algorithm was applied to calculated plaque burden (Figure). Plaque morphology was assessed according to international consensus in OCT imaging.

RESULTS After 6-months, we found comparable plaque volumes and plaque surface areas in both patients with N = 19 DES: plaque volume 10.1 ± 10.3 mm3, plaque area 16.8 ± 14.1 mm2 vs. N = 19 DES: plaque volume 11.9 ± 15.7 mm3, plaque area 15.5 ± 20.6 mm2, n.s.). No association between neointimal proliferation or stent malapposition/stent coverage and global plaque burden within the stented vessel segments was found. However, there was a significantly greater plaque burden 6-months compared to 2 months after elective PCI (Plaque volume: 10.09 ± 10.28 mm3 vs. 3.14 ± 3.89 mm3, p = 0.004; plaque surface area: 16.81 ± 14.11 mm2 vs. 6.0 ± 7.47 mm2, p = 0.003).