Intracoronary plaques were visualized by a “spread-vessel-chart” in relation to their position within the stent and their morphology (color-coded, Figure).

CONCLUSIONS (1) This novel 3D OCT plaque analysis is feasible, and allows comprehensive evaluation and quantification of intracoronary plaques and their spatial relationship with adjacent structures (e.g. stent struts, side branches, thrombi). (2) Coronary stent placement did not stop atherosclerotic plaque progression in this small patient group.

CATEGORIES IMAGING: Intravascular

KEYWORDS OCT, Percutaneous coronary intervention, elective, Plaque

TCT-365

The relationship between intravascular ultrasound (IVUS) plaque burden and lesion characteristics by Optical Coherence Tomography (OCT): a multimodality imaging study

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BACKGROUND Intravascular Ultrasound (IVUS)-derived plaque burden (PB) is a powerful predictor of major adverse cardiovascular events (MACE). While OCT provides histology-grade definition of coronary plaque morphology in vivo, it does not allow for direct assessment of PB due to limited depth penetration. The value of OCT for the estimation of plaque burden has not been investigated. Accordingly, we sought to identify OCT-derived correlates of IVUS PB and to assess the diagnostic accuracy of OCT in detecting lesions with large plaque burden (PB ≥70%).

METHODS We retrospectively analyzed a total of 110 consecutive patients with stable coronary disease who underwent optical coherence tomography (OCT), IVUS, and near infrared spectroscopy (NIRS) before their percutaneous coronary intervention (PCI). Culprit lesions were divided according to IVUS-derived PB ≥70% (PB Large; n=86) and lesions with PB<70% (PB small; n=24).

RESULTS Simultaneous OCT analysis showed increased maximum lipid arcs (220.100 vs. 118.450, P < 0.01), longer lipid pools (8.00 µm vs. 2.00 µm, P < 0.032); greater lipid volume index [averaged lipid arc × lipid length] (991.79 vs. 179.57, P < 0.002), thinner fibrous caps (80.00 µm vs. 110.00 µm, P < 0.009), smaller minimum lumen cross sectional area (1.62 mm2 vs. 2.13 mm2, P=0.002), and a higher lumen area stenosis (72% vs. 60%, P=0.001). Lipid volume index, lipid length, minimum cap thickness, and maximum lipid arc in combination with lumen area stenosis had significant strong association with IVUS plaque burden by multivariate linear regression analysis (R²=0.445, 0.432, 0.393, 0.336 correspondingly). Best accuracy for the detection of PB Large was achieved using maximum lipid arc = 144.60 (area under the curve (AUC) = 0.806; SS=84%, SP=75%), and lumen area stenosis = 69.2% (AUC = 0.764; SS=66%, SP=83%) as cutoff values.

CONCLUSIONS OCT characteristics of the lipid core size (maximum arc, length, lipid volume index) and lumen area stenosis provide the strongest correlation with IVUS plaque burden.

CATEGORIES IMAGING: Intravascular

KEYWORDS Coronary artery disease, Intravascular ultrasound, Optical coherence tomography

TCT-366

Comparison of Plaque Morphology Between Peripheral and Coronary Artery Disease: Analysis from the CLARITY and ADAPT-DES IVUS Substudies

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BACKGROUND Intravascular Ultrasound (IVUS)-derived plaque burden (PB) is a powerful predictor of major adverse cardiovascular events (MACE). While OCT provides histology-grade definition of coronary plaque morphology in vivo, it does not allow for direct assessment of PB due to limited depth penetration. The value of OCT for the estimation of plaque burden has not been investigated. Accordingly, we sought to identify OCT-derived correlates of IVUS PB and to assess the diagnostic accuracy of OCT in detecting lesions with large plaque burden (PB ≥70%).

METHODS We retrospectively analyzed a total of 110 consecutive patients with stable coronary disease who underwent optical coherence tomography (OCT), IVUS, and near infrared spectroscopy (NIRS) before their percutaneous coronary intervention (PCI). Culprit lesions were divided according to IVUS-derived PB ≥70% (PB Large; n=86) and lesions with PB<70% (PB small; n=24).

RESULTS Simultaneous OCT analysis showed increased maximum lipid arcs (220.100 vs. 118.450, P < 0.01), longer lipid pools (8.00 µm vs. 2.00 µm, P < 0.032); greater lipid volume index [averaged lipid arc × lipid length] (991.79 vs. 179.57, P < 0.002), thinner fibrous caps (80.00 µm vs. 110.00 µm, P < 0.009), smaller minimum lumen cross sectional area (1.62 mm2 vs. 2.13 mm2, P=0.002), and a higher lumen area stenosis (72% vs. 60%, P=0.001). Lipid volume index, lipid length, minimum cap thickness, and maximum lipid arc in combination with lumen area stenosis had significant strong association with IVUS plaque burden by multivariate linear regression analysis (R²=0.445, 0.432, 0.393, 0.336 correspondingly). Best accuracy for the detection of PB Large was achieved using maximum lipid arc = 144.60 (area under the curve (AUC) = 0.806; SS=84%, SP=75%), and lumen area stenosis = 69.2% (AUC = 0.764; SS=66%, SP=83%) as cutoff values.

CONCLUSIONS OCT characteristics of the lipid core size (maximum arc, length, lipid volume index) and lumen area stenosis provide the strongest correlation with IVUS plaque burden.

CATEGORIES IMAGING: Intravascular

KEYWORDS Coronary artery disease, Intravascular ultrasound, Optical coherence tomography
BACKGROUND Morphological differences in the patterns of coronary artery and peripheral artery atherosclerosis have not been well described.

METHODS CLARITY was a prospective, multi-center trial in which 50 peripheral arterial disease (PAD) pts with a lower extremity wound fed by a diseased tibial or peroneal artery with diameter stenosis >50% were enrolled to evaluate orbital atherectomy compared to balloon angioplasty alone using intravascular ultrasound (IVUS). ADAPT-DES was a prospective, multicenter, “all-comers” registry of 8582 coronary artery disease (CAD) pts undergoing successful percutaneous coronary intervention (PCI); a pre-specified substudy included 780 pts with baseline IVUS data. We compared pre-intervention IVUS findings in 42 PAD lesions from CLARITY vs 79 CAD lesions from ADAPT that were matched 1:2 for age, gender, diabetes, hypertension, hyperlipidemia, and renal insufficiency. Vessel and lumen were measured every 1 mm, and total volume and mean volume (=volume/length) were calculated. Furthermore, within each lesion 5 equidistantly spaced cross-sections from the proximal to the distal edge were identified, and calcium arc and plaque eccentricity (min/max plaque thickness) were analyzed.

RESULTS Compared to CAD lesions, PAD lesions had 1) smaller mean vessel, plaque and lumen volumes; and 2) twice the lesion length (Table). Maximum superficial calcium arc and plaque eccentricity measures at the MLA were greater (ie. more concentric plaque) in PAD lesions than in CAD lesions. Calcium arc and plaque eccentricity were positively correlated to the plaque burden (PB) in PAD lesions than in CAD lesions. Calcium arc and concentricity were greater in PAD compared to CAD independent of the degree of plaque burden (PB) (Table).

CONCLUSIONS Compared to CAD lesions, PAD lesions were longer, had more concentric, diffuse, and calcified plaque, and vessels volumes were smaller. These differences may in part explain different responses to pharmacologic, interventional and surgical therapies.

CATEGORIES IMAGING: Intravascular

KEYWORDS Intravascular ultrasound, Peripheral arterial disease

TCT-367 Evolution of Plaque Volume and Lesion Morphology in Patients with Non-culprit Lesion-related Events: A serial VH-IVUS analysis from the PROSPECT study

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BACKGROUND Serial evolution in untreated coronary lesion morphology associated with and without cardiac events has not previously been prospectively described.

METHODS In PROSPECT, 3-vessel grayscale and virtual histology intravascular ultrasound (VH-IVUS) was performed in 697 acute coronary syndrome pts following successful PCI. By protocol, repeat 3-vessel VH-IVUS was to be performed at the time of major adverse cardiac events (MACE).

RESULTS During a median follow-up (FU) of 3.4 years, serial VH-IVUS studies were performed in 44 pts in 144 previously untreated non-culprit lesions (NCLs); 17 NCLs were responsible for MACE (Event-NCLs) while 127 NCLs in the same pts were not associated with events (Non-event-NCL). Although the baseline prevalence of VH-TCFAs was not different (45.3% vs. 22.0%, p = 0.001) and plaque burden at the MLA site was greater [71.2 (67.3, 75.0) % vs 56.9 (50.4, 62.6) %, p < 0.001] in Event-NCLs compared to Non-event-NCLs, although the baseline prevalence of VH-TCFAs was not different (35.3% vs. 22.0%, p = 0.23) in this subset of pts. Although the change in plaque volume from baseline to FU was not statistically different between Event-NCLs and Non-event-NCLs [410 (-12.5, 31.4) mm3 vs -47 (-26.2, 19.8) mm3, p = 0.24], the increase of necrotic core [2.9 (-1.3, 12.4) mm3 vs 0.3 (-2.1, 4.9) mm3, p = 0.09] and dense calcium volume [2.4 (0.6, 7.0) mm3 vs 0.4 (-0.5, 0.9) mm3, p = 0.001] were greater in Event-NCLs than in Non-event-NCLs. Baseline minimum lumen area (MLA) was significantly smaller [4.0 (3.3, 5.4) mm2 vs 5.9 (4.5, 8.1) mm2, p < 0.001] and plaque burden at the MLA site was greater [71.2 (67.3, 75.0) % vs 56.9 (50.4, 62.6) %, p < 0.001] in Event-NCLs compared to Non-event-NCLs, although the baseline prevalence of VH-TCFAs was not different (35.3% vs. 22.0%, p = 0.23) in this subset of pts. Although the change in plaque volume from baseline to FU was not statistically different between Event-NCLs and Non-event-NCLs [410 (-12.5, 31.4) mm3 vs -47 (-26.2, 19.8) mm3, p = 0.24], the increase of necrotic core [2.9 (-1.3, 12.4) mm3 vs 0.3 (-2.1, 4.9) mm3, p = 0.09] and dense calcium volume [2.4 (0.6, 7.0) mm3 vs 0.4 (-0.5, 0.9) mm3, p = 0.001] were greater in Event-NCLs than in Non-event-NCLs.