Incidence, diagnosis and clinical outcomes of patients with impaired coronary vasoreactivity: insights from a protocol of systematic coronary artery spasm detection over ten years. 

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Background: Non-specific chest symptoms associated with coronary artery spasm (CAS) remain underdiagnosed and consequently undertreated. Our center applies a policy of systematic CAS detection by provocative tests (PT) in normal or near normal coronary arteries in patients with symptoms compatible with vasospastic origin. We retrospectively studied the prevalence of CAS, safety of PTs and patient outcome over a 10-year period.

Methods: From December 2002 to July 2012, 13,902 patients underwent 18,454 coronary angiographies. Gray zone group comprised 96 patients with normal or near normal arteries underwent 2,397 PTs. 256 were consequently diagnosed with CAS (10.7%). In addition, among the 7,940 patients with a ≥50% stenosis on coronary angiography, 44 patients were diagnosed as having a spontaneous CAS (0.6%).

Results: Compared to the overall population, patients with CAS were more often female (44.7% vs. 29.6%; p<0.0001), younger (55 [47.5-64] vs. 61 [52-70] years; p<0.0001), and more often smokers (63.7% vs. 42.3%; p<0.0001). Initial presentation was more frequently acute coronary syndrome (37.4% vs. 28.9%) and non-specific chest pain (41.8% vs. 21.6%). Sixty-nine patients had refractory CAS when PT was abnormal under antispastic treatment. 99.1% of the patients who underwent a PT had an event-free hospital course. At 46 months, the all-cause death rate, myocardial infarction, stroke and revascularization in CAS patients were 4.3%, 0% and 4.3%, respectively.

Conclusions: This retrospective study of 10 years of experience suggests that CAS is safe in patients with normal or near normal coronary angiography. These findings could justify performing PTs more systematically in this setting to avoid the potentially severe outcomes of undiagnosed CAS.

TCT-612

Endothelial function and STEMI vessel patency

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Background: STEMI patients who present with open culprit vessels have on average better clinical outcome. Functional endothelium regulates platelet aggregation, controls endogenous fibrinolysis, and may play a crucial role for culprit vessel patency in the setting of STEMI. Nevertheless, clinical data on the relation between endothelial function and culprit vessel patency in STEMI patients are scarce.

Methods: This prospective cohort study included 61 STEMI patients, who had all undergone primary percutaneous coronary intervention (PPCI). Four to six weeks later, endothelial function was non-invasively assessed by use of the reactive hyperemia peripheral artery tonometry (RH-PAT) method.

Results: The RH-PAT index measured on average 1.89±0.57. In patients with patent culprit vessels before PPCI (n=26, 42.6%), endothelial function was significantly better than in patients with occluded culprit vessels (n=35, 57.4%) (RH-PAT index 2.09±0.62 vs. 1.74±0.48; p<0.01). Compared to patients with normal endothelial function, the quintile of patients with the most severe endothelial dysfunction had a nine-fold higher risk of presenting with an occluded culprit vessel (OR 9.0, 95% CI 1.4-58.4). Logistic regression analysis revealed that this relation between endothelial function and vessel patency became even stronger after adjustment for potential confounders (adjusted OR 13.3, 95% CI 1.3-134.0).

Conclusions: Not all delayed lesions based on FFR >0.75 were equally safe during the follow up period. Patients with deferred coronary lesions with the gray zone FFR had higher risk of TVF in the future than those with FFR >0.80.
Conclusions: In this series of patients with acute STEMI, superior endothelial function was independently associated with a higher likelihood of presenting with an initially patent culprit vessel.

TCT-613
Does High Dose Atorvastatin Pre-treatment Prevent Microvascular Dysfunction After Percutaneous Coronary Intervention in Patients with Acute Coronary Syndrome?: A Randomized Comparison Study Using the Index of Microcirculatory Resistance
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Background: Statins decreases the incidence of myocardial infarction after percutaneous coronary intervention (PCI) presumably by attenuating the effect of distal embolization. This study evaluated the effect of pre-treatment with high dose atorvastatin on microvascular disruption in non-ST elevation acute coronary syndrome (NSTE-ACS) patients undergoing PCI.

Methods: Patients with NSTE-ACS were randomly assigned to pre-treatment with high dose atorvastatin (80 mg loading within 24 hours plus 40mg within 2 hours before PCI, n=39) or to control (atorvastatin 10mg administration within 24 hours before PCI, n=38). Post-procedural IMR defined as the mean distal coronary pressure multiplied by the mean transit time at maximal hyperemia using an intracoronary pressure/temperature sensor-tipped guidewire was measured. Creatine kinase-myocardial band (CK-MB) and C-reactive protein (CRP) levels were measured at baseline and at 12-24 hours after PCI.

Results: The patients’ baseline demographic and clinical characteristics were not different between the two groups. The post-PCI IMR was lower in the high dose group (median:13.0 [interquartile range (IQR):10.4 to 16.8] vs. 17.5 [IQR:13.0 to 23.6], p=0.002). As was the Post-PCI CK-MB (median:1.40 [IQR:0.75 to 3.45] vs. 4.00 [IQR:1.70 to 7.37] ng/mL, p=0.002) and post-PCI CRP level (median:0.09 [IQR:0.04 to 0.16] vs. 0.22 [IQR:0.08 to 0.60] mg/dL, p=0.001).

Conclusions: The post-PCI IMR, CK-MB and CRP were lower in patients receiving high dose atorvastatin loading before PCI. Pre-treatment with high dose atorvastatin reduces microvascular damage after PCI in patients with NSTE-ACS.

TCT-614
Patient-specific Coronary Stenoses Can Be Modeled Using a Combination of Optical Coherence Tomography and Flow Velocities to Accurately Predict Hyperaemic Pressure Gradients
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Background: Computational fluid dynamics (CFD) modeling of patient-specific coronary arteries remains limited by image resolution and the phasic nature of flow. Patient-specific pressure and flow data may overcome these limitations. We applied a 3D reconstruction technique that uses high-resolution OCT imaging with invasively measured phasic pressure and flow velocity to predict distal coronary pressure waveforms using CFD.

Methods: 21 vessels in 19 patients underwent OCT and angiographic reconstruction. Invasive simultaneous pressure and flow velocity recordings were made under adenosine-mediated hyperaemia. The patient-specific pressure (Pa) and distal flow velocity data was applied in phasic simulations using the anatomical models to calculate the distal phasic pressure waveform (Pd). These were compared to invasively measured Pd.

Results: The computed waveforms corresponded closely to the invasive waveforms (Figure). Across all vessels studied, computed waveforms correlated significantly with invasively measured waveforms (r = 0.90±0.005, p<0.01). The mean of differences between measured and simulated waveforms was -3.45±0.12 mmHg.

Conclusions: When invasively acquired flow velocity is applied to OCT-derived models, a phasic pressure waveform can be produced which resembles closely the invasively measured waveforms. Therefore the constructs likely provide a realistic model of flow resistance. The findings suggest this model could allow phasic analysis of either pressure or flow when only one is known, and suggests this model could incrementally improve CFD to determine clinically relevant information.