TCT-609

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. 5,962 of these 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] years 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%, 3.3%, 0% and 4.3%, respectively.
Conclusions: This retrospective study of 10 years of experience suggests that CAS is present in as many as 10.7% of patients with chest symptoms at rest. PT seems to be 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.

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Deferred Coronary Lesion With A Gray Zone Fractional Flow Reserve In Patients With Intermediate Stenosis Is At Higher Risk Of Future Coronary Events

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Background: Deferral of revascularization of an intermediate coronary stenosis with fractional flow reserve (FFR) ≧0.75 was reported to be safe. However, the FFR value range between 0.75 and 0.80 has been recognized as a gray zone. We hypothesized that outcomes after deferral of revascularization between coronary lesions with gray zone FFR and those with non-ischemic FFR (>0.80) might be different. The aim of this study was to evaluate the clinical outcomes of patients with intermediate coronary stenosis with gray zone FFR compared to those with FFR >0.80.
Methods: We reviewed medical records of patients who underwent an FFR measurement at our hospital between January 2008 and December 2011. Long-term outcomes of 153 patients with angiographically intermediate coronary lesions deferred from revascularization on the basis of an FFR > 0.75 were obtained. We divided the patients into two groups. Gray zone group consisted of 57 patients with FFR values between 0.75 to 0.80. Non-ischemia group comprised 96 patients with FFR values above 0.80. The outcome of the gray zone group was compared with that of the non-ischemia group. The primary endpoint of this study was target vessel failure (TVF) defined as cardiac death, target vessel related myocardial infarction, and ischemia-driven target vessel revascularization.
Results: There were no differences in baseline clinical characteristics between two groups. Mean FFR value of deferred lesions was significantly lower in the gray zone group than the non-ischemia group (0.78 ± 0.02 vs. 0.88 ± 0.05). During a mean follow-up period of 2.8 ± 1.2 years, TVF occurred in 11 deferred lesions (7.2%). The incidence of TVF was significantly different between two groups: 14.0% in the gray zone group and 3.1% in the non-ischemia group (hazard ratio: 4.043, 95% confidence interval, 1.048 to 15.603; p = 0.043).
Conclusions: Not all deferred 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.

TCT-611

Impact of Post-Stent Fractional Flow Reserve on Long-Term Adverse Event After Drug-Eluting Stent Implantation

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Background: Previous studies have identified post-stent fractional flow reserve (FFR) >0.90 as a useful surrogate for favorable long-term clinical outcome after bare-metal stent implantation. However, the prognostic value of post-stent FFR after drug-eluting stent (DES) implantation remains undetermined.
Methods: For 156 DES implanted lesions, FFR measurement at maximum hyperemia was performed after stent implantation. Follow-up angiography was scheduled between 6 and 12 months after index intervention. Angiography was also performed in the late phase based on patient's clinical conditions and physician's decision. The relationship between post-stent FFR and target lesion revascularization (TLR) was evaluated.
Results: A FFR value was significantly increased by stent implantation from 0.69±0.12 to 0.88±0.06 (p<0.0001). A FFR value > 0.90 was achieved in 63 patients (40.3%). During follow-up, TLR occurred in 12 lesions (7.7%). There was no significant difference in post-stent FFR between lesions with or without TLR (0.89±0.07 vs. 0.89±0.07; p=0.86). After grading lesions to 5 categories according to the post-stent FFR (0.75 to 0.80, 0.81 to 0.85, 0.86 to 0.90, 0.91 to 0.95, and 0.96 to 1.00), there was no significant difference in the incidence of TLR among 5 categories (18.8%, 3.1%, 4.4%, 8.8%, 10.3%; p=0.32).
Conclusions: In patients who were treated with DES, post-stent FFR is not a predictor of long-term adverse event.

TCT-612

Endothelial function and STEMI vessel patency

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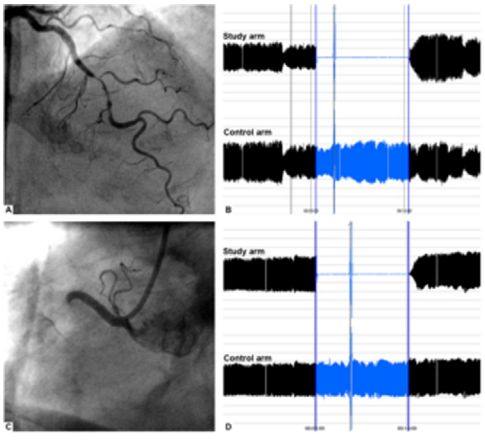
Background: STEMI patients who present with open culprit vessels have on average better clinical outcome. Functional endothelium regulates platelet aggregation, controls endogenous fibrinolysis, and may play a crucial role for culprit vessel patency in the setting of STEMI. Nevertheless, clinical data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



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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.

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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).

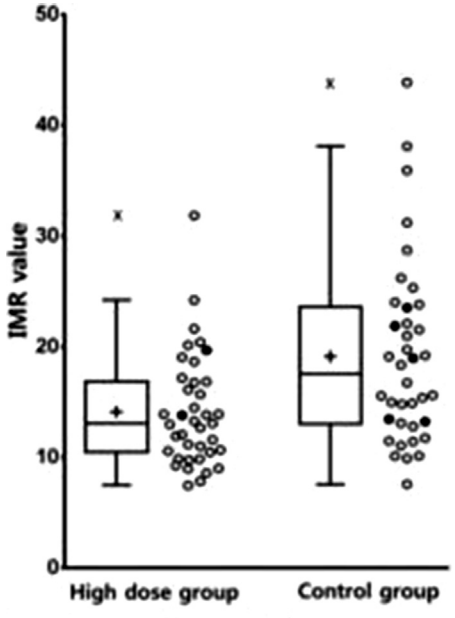

Figure. Distribution of Post-PCI IMR Values Among Patients Treated With and Without High Dose Atorvastatin Loading Before PCI
Solid circles show CK-MB>3X the upper limit of normal level; **open circles** show CK-MB<3X the upper limit of normal level; IMR=index of microcirculatory resistance; PCI=percutaneous coronary intervention.

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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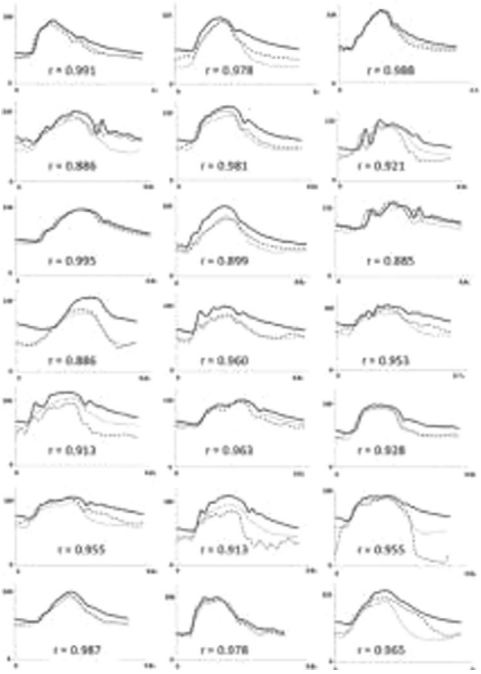
Background: Computational fluid dynamics (CFD) modeling of patient-specific coronary arteries remain limited by image resolution and the phasic nature of flow. Patient-specific pressure and flow data may overcome these limitations. We applied a 3D reconstruction technique that uses high-resolution OCT 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 ($r = 0.90 \pm 0.005$, $p<0.01$). 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.

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