Methods: Intracoronary motorized pressure-wire pullbacks were performed under resting conditions in 32 coronary arteries with tandem and diffuse disease. Computer-aided virtual PCI was performed to determine a predicted or expected post-PCI iFR (iFRexp) assuming the perfect removal of a given stenosis or segment of disease. This was compared to the observed iFR post real-world PCI (iFRobs).

Results: Mean vessel iFR pre-PCI was 0.78±0.03. Virtual PCI predicted an expected iFRexp of 0.94±0.01. The observed iFR after real-world PCI was iFRobs 0.93±0.01 with no significant difference for the predicted and observed incremental increase (ΔiFRexp 0.16±0.03 vs. ΔiFRobs 0.13±0.03 p=0.48). No significant systematic bias or underestimation of stenosis severity between iFRexp and iFRobs measures was observed (Bland-Altman mean difference 0.016±0.004).

Conclusions: Resting pressure wire pullback, using iFR, can be used to produce a physiologic map of the entire coronary vessel to identify and measure the localized effects of different stenoses, and predict expected results of stenting prior to PCI. This may assist in planning PCI to complex coronary lesions.

TCT-312
Prediction of the True Fractional Flow Reserve of Left Main Coronary Artery Stenosis with Concomitant Downstream Stenoses: in vitro and in vivo Experiments
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Background: The functional impact of downstream coronary stenoses on the LMCA is not fully elucidated. The study aim is to assess two novel equations which predict true FFR of the LMCA stenosis with downstream stenoses in vitro and in vivo experiments.

Methods: Two novel equations are mathematically derived. One equation predicts the true FFR of the LMCA stenosis with a downstream stenosis (Equation A), and the other predicts the true FFR of the LMCA stenosis with downstream stenoses both in the LAD and LCX (Equation B). The equations are written as follows when FFRpred-m = predicted FFR of LMCA, FFRm = apparent FFR of LMCA, FFR1, FFR2 = FFR of downstream LAD, LCX, n = LAD/LCX flow ratio when there are no stenoses both in the LAD and LCX. Equation A: FFRpred-m = (FFR1+FFRm)/((n+1)-nFFRm+nFFR1) Equation B: FFRpred-m = (nFFR1+FFR2)/((n+1)-1-nFFRm+nFFR1+FFR2).

Results: The equations are validated in vivo and vitro model. The predicted FFR calculated from Equation A and B showed a close positive correlation with the true FFR calculated from Equation A and B (r=0.95). The predicted FFR showed a close positive correlation with the true FFR in all experiments.

Conclusions: Resting pressure wire pullback, using iFR, can be used to produce a physiologic map of the entire coronary vessel to identify and measure the localized effects of different stenoses, and predict expected results of stenting prior to PCI. This may assist in planning PCI to complex coronary lesions.
Conclusions: CFC provides a disruptive physiological concept, originally derived from PET-imaging, integrating CFR and hyperemic flow (hAPV) to depict the ischemic burden of the myocardium. The study acknowledged the provocative implications of adding hAPV to CFR within the CFC concept derived from invasive measurements.

Methods: Coronary pressure and flow velocity were measured in 154 patients in whom revascularization was deferred in the pre-FAME era. The additive value of hAPV to CFR was tested with the net reclassification index (NRI), integral discrimination improvement (IDI) and relative IDI. After stratification in normal, mildly reduced, moderately reduced, and severely reduced CFC, using literature-derived CFR cut-offs and the corresponding hAPV percentiles, event rates up to 10 years follow-up were estimated with the Kaplan Meier method, and a Cox proportional hazards model was used to test the association of CFC with MACE, adjusting for confounding variables (p<0.1).

Results: Median follow-up was 11.9 years (10.0–13.4 years). CFR was significantly associated with MACE (p=0.001). The addition of hAPV to CFR yielded an NRI of 0.49 (63.7% vs. 42.3%; p<0.0001), and a 2.8-fold (95% CI: 1.2–5.8) increase in MACE, respectively. Conclusions: The addition of hAPV to CFR in the CFC concept improves its discriminative value. MACE. CFC may provide a disruptive physiological concept, applicable to all diagnostic modalities that measure flow.

TCT-316
Impact of Coronary Artery Size on Physiologic Microcirculatory Indices: A Volumetric Intravascular Ultrasound Study with Coronary Flow Assessment
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Background: Microvascular dysfunction has been associated with increased mortality. However, little is known whether physiologic microcirculatory indices can fundamentally be affected by coronary dimensions.

Methods: Volumetric IVUS (50 mm length) and physiologic assessment (Fractional Flow Reserve [FFR], Coronary Flow Reserve [CFR], and Index of Microcirculatory Resistance [IMR]) were performed in two hospitals with non-obstructed epicardial arteries. Coronary flow was assessed with a thermo-dilution method by obtaining mean transit time (Tmn): an inverse correlate to absolute flow) at rest and hyperemia. IMR was measured as distal coronary pressure x hyperemic Tmn.

Results: No patient had significant stenosis in LAD (FFR: 0.87±0.04, %plaque volume: 26.6±9.0%). Resting Tmn positively correlated with vessel and lumen volumes (p<0.01, p=0.04), whereas hyperemic Tmn showed no correlation with the artery size. As a result, IMR was unrelated to any IVUS indices, while CFR positively correlated with the artery size (p=0.001 for both vessel and lumen). With microvascular dysfunction defined as IMR ≥25, ROC analysis determined CFR=3.75 as the best cutoff. Discordance of reduced CFR with normal IMR was seen in patients with smaller artery size, leading to shorter resting Tmn, despite the equivalent % plaque volume and hyperemic Tmn (Figure).

Conclusions: Small coronary size may increase resting coronary flow, reducing CFR even in the absence of epicardial stenosis and microvascular dysfunction. Potential impact of artery size should be noted in interpretation of physiologic indices during resting flow status.

TCT-317
Systematic detection of coronary vasospasm by methylxymonobine-based provocative test in 2,397 patients
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Background: In the absence of clear-cut indications for provocative test (PR), coronary artery spasm (CAS) may be underdiagnosed whereas the widespread use of early coronary angiography has found that acute ischemic syndromes are not always related to atherosclerosis. The objective of the present study was to evaluate the incidence of CAS in a population of patients with chest pain who underwent methylergonovine-based PT.

Methods: The present study is a retrospective analysis from a University tertiary care hospital where a policy of systematic detection of CAS by PT is applied in patients with chest pain at rest and without significant coronary stenosis. PT complications include death, MI, stroke, delayed or persistent CAS, ventricular fibrillation, and acute atrioventricular block.

Results: During a 10-year period (2002-2012), a total of 18,454 angiographies were performed. CAS was documented in 256 (10.7%) of the 2,397 patients with normal or near normal coronary arteries and chest pain who underwent PT. Compared to the overall population, CAS patients 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 smokers (63.7% vs. 42.3%; p<0.0001). Initial presentation was more frequently acute coronary syndrome (36.7% vs. 29.1%) or non-specific chest pain (46% vs. 21.9%). The rate of complications after PT was 0.9% (n=23). Complications included delayed or persistent CAS (0.3%), VF/asytoly/AVB (0.3%), transient ischemic attack (0.2%), and non Q wave MI (0.04%). Urgent coronary stenting was required to restore arterial patency in three patients with persistent CAS.

Conclusions: This retrospective study of 10 years of experience suggests that CAS is present in 10.7% of patients with myocardial ischemia symptoms at rest and without significant coronary stenosis. Methylxymonobine based PT appear to be extremely safe when performed in selected patients with normal or near normal coronary arteries. These findings could justify performing PT more systematically in this setting to avoid the potentially severe outcomes of undiagnosed CAS.

TCT-318
Translesional FFRct gradient correlates with measured FFR gradient in vessels with serial coronary stenosis: role in stenting strategy
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Background: Fractional flow reserve derived from coronary CT (FFRct) has high diagnostic accuracy compared to FFRcath, and modulation of the FFRct with “virtual