stenting is feasible for predicting the effect of PCI. However, the validity of FFRct along the length of a vessel compared with FFRcath is unknown. The purpose of this study is to compare trans-lesional FFRcath vs. FFRct gradients in vessels with serial stenoses.

**Methods:** 18 patients with stable coronary artery disease had pull-back FFRcath measurements across the serial lesions. In each patient FFRcath was performed utilizing pre-cath cCTA data. Blinded comparisons of FFRcath and FFRct at co-registered points were performed. Computational models were then modified to simulate virtual stenting strategy of the proximal, distal or both lesions.

**Results:** 18 vessels were assessed, with ischemia (FFRcath ≤0.80) present in 13 (72.2%). Each patient had 2 or more angiographic stenoses >30% with trans-lesional FFRcath gradient of 0.10±0.09. The correlation between FFRcath and FFRct gradient was r=0.92, p<0.001. Virtual stenting demonstrated a wide range of scenarios with the need for one or two stents for relief of the ischemia. Figure 1 exemplifies a case in which stenting of each single lesion did not result in FFRct >0.8. Virtual stenting of both stenoses relieved the ischemia with final FFRct = 0.84.

**Conclusions:** Trans-lesional FFRct gradient correlates closely with FFRcath gradient in vessels with serial stenoses. This is a core foundation for the potential usefulness of computational modeling to evaluate and plan treatment of complex and serial stenoses.

**TCT-319**

Instantaneous wave-free ratio (iFR) and fractional flow reserve (FFR) are equally able to identify ischaemia and flow limitation: a pooled analysis of studies against SPECT, HSR, CFR and PET

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**Background:** The instant wave-free ratio (iFR) and fractional flow reserve (FFR) are indices of coronary disease severity which use pressure as a measure of lesion significance. The aim of this study was to quantify iFR and FFR individual ability to detect ischaemia and flow limitation against multiple perfusion modalities.

**Methods:** Pooled analysis of data using a random effect model. 4 studies which compared iFR and FFR against the following perfusion modalities were included: SPECT (scintigraphy), positron emission tomography (H215O PET), hyperaemic stress resistance (HSR) and coronary flow reserve (CFR). In total, 265 stenoses in 220 patients were evaluated. The performance of iFR and FFR to detect ischaemia or flow limitation was compared using the area under the ROC curve (AUCROC).

**Results:** Baseline iFR and hyperaemic FFR demonstrated equal overall agreement with methods of perfusion (iFR AUCROC=0.88, FFR AUCROC=0.88) (Figure). When non-invasive perfusion methods were used as reference standards, iFR was non-inferior to FFR (iFR-SPECT AUCROC=0.84 vs FFR-SPECT AUCROC=0.88, p>0.2; iFR-PET AUCROC=0.85, FFR-PET AUCROC=0.86, p>0.2). When invasive flow indices were used as reference comparisons, iFR was non-inferior (iFR-HSR AUCROC=0.95 vs FFR-HSR AUCROC=0.97, p>0.3) or superior to FFR (iFR-CFR AUCROC = 0.82 vs FFR-CFR AUCROC=0.72, p<0.01) to detect flow limitation.

**Conclusions:** iFR and FFR are equally able to detect ischaemia and flow limitation, against multiple perfusion modalities. Studies with hard clinical endpoints will evaluate whether the non-inferiority of iFR will translate into favourable clinical outcomes.
Conclusions: FFR guided PCI showed the similar clinical outcomes with concurrent CABG with different safety and efficacy profile. Our results should be confirmed in the ongoing randomized clinical trial.

TCT-321
Invasively Derived Coronary Flow Capacity: Diagnostic Implications of a Cross-modality Physiological Concept
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Background: Coronary flow capacity (CFC) is a cross-modality physiological concept, which integrates both CFR and hyperemic flow to depict the ischemic burden of the myocardium. Originally derived from positron emission tomography (PET) imaging, moderate to severe impairment of CFC has been strongly linked to electrical and clinical manifestations of myocardial ischemia, while no ischemia occurs with normal or mildly reduced CFC. Analogous to PET-derived CFR, we derived an invasive CFC concept, and studied the relationship of fractional flow reserve (FFR) and hyperemic stenosis resistance (HSR) with CFC-defined blood flow impairment.

Methods: Coronary pressure and flow velocity were measured in 299 stenoses. After stenosis, in normal, mildly reduced, moderately reduced, and severely reduced CFC using literature-derived CFR cut-offs and the corresponding hyperemic flow velocity percentiles, FFR and HSR outcomes were evaluated across the four CFC groups.

Results: Identification of severely reduced CFC was excellent for FFR<0.80 (90% agreement) and HSR>0.80 mm Hg/cm/s (92% agreement). However, 40% and 43% of vessels with normal or mildly reduced CFC had a positive FFR (<0.80). Notably, FFR decreased to 0.77 [0.71-0.81] and 0.49 [0.40-0.64] in the moderately and severely reduced CFC categories (P<0.05 compared with all other CFC categories), where 75% of stenoses with severely reduced CFC had FFR<0.65. HSR increased significantly with decreasing CFC, and showed less discordance with CFC than FFR (6% and 11% for normal or mildly reduced CFC). Notably, 13 out of 15 stenoses associated with moderately or severely reduced CFC not identified by FFR<0.80, were characterized by high HMR (3.24 mm Hg/cm/s [2.69–3.37 mm Hg/cm/s]), and low HSR (0.53 mm Hg/cm/s [0.46–0.60 mm Hg/cm/s]), suggestive of microcirculatory disease or low-flow ischemia.

Conclusions: Coronary flow characteristics that determine signs of ischemia are associated with FFR values far below contemporary interventional thresholds. FFR seems oversensitive in high-flow settings, and insensitive in low-flow settings. These findings corroborate concerns using a pressure-derived estimate of coronary flow impairment.

TCT-322
Implications Of Human Coronary Autoregulation On Functional Assessment Of Coronary Artery Stenosis Significance Under Baseline Conditions
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Background: Recently, several parameters (iFR, PA/Pa and BSR) were proposed to detect functional significance of coronary artery disease (CAD) using coronary pressure obviating the need for hyperemia. These parameters show a good correlation with hyperemic fractional flow reserve (FFR). Coronary autoregulation, i.e. more dilatation in case of more severe epicardial stenosis could be an explanation. Although some experimental data point in this direction, the hypothesis has never been tested in humans.

Methods: Simultaneous measurements of coronary pressure and Doppler flow velocity were obtained in 253 vessels in patients with suspected CAD. FFR was used to indicate functional stenosis severity, while baseline PA/Pa determined the transstenotic pressure ratio. Coronary resistance reserve (CRR) was defined as the ratio of hyperemic and basal microvascular resistance, indicating the degree of autoregulation. Baseline average peak velocity (APV) was used as surrogate for coronary flow.

Results: The figure shows that with increasing stenosis severity (by FFR), baseline PA/Pa shows a concomitant progressive decline (P<0.001 for trend). Also, CRR decreases with increasing stenosis severity (P<0.001 for trend) and a stable baseline APV is maintained (P=0.25 for trend).

Conclusions: With progressive stenosis severity, baseline coronary flow is preserved by microvascular resistance reduction (coronary autoregulation), resulting in decreased perfusion pressure. This explains in part the good performance of resting pressure measurements to detect significant CAD.

TCT-323
Diastolic fractional flow reserve (FFR) closely tracks whole-cycle FFR
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Background: FFR explicitly selected whole-cycle measurements to focus on epicardial resistance while minimizing capacitive and inductive effects. However, subsequent work proposed diastolic FFR because coronary flow occurs predominately during this phase of the cardiac cycle.

Methods: VERIFY enrolled consecutive patients from 5 global sites and used IV adenosine hyperemia. Each FFR measurement was repeated following a 2 minute rest period. Whole-cycle and diastolic FFR were computed at a central core lab by averaging 5 consecutive cycles. Diastole began at the dicrotic notch and ended at the anacrotic limb.

Results: In 206 patients, test/retest repeatability was excellent for both whole-cycle and diastolic FFR. An extremely linear relationship existed between the two FFR metrics, implying that whole-cycle FFR explains 95% of the variation in diastolic FFR. ROC analysis demonstrated an AUC over 98% for diastolic FFR to predict FFR<0.8.

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