Background: Fractional flow reserve (FFR) guided percutaneous coronary intervention (PCI) has been validated in the FAME trial, which demonstrated a statistically significant reduction in the composite of death or myocardial infarction compared to an angiographic-guided approach. At two years of follow-up, 3.2% of patients who had deferral of a FFR negative stenosis (>0.80) returned for revascularization of the deferred lesion. Only 0.2% of the deferred lesions resulted in a late myocardial infarction (MI). We sought to evaluate the outcomes of FFR-deferred lesions in a community-based cardiac referral center.

Methods: A retrospective analysis was conducted of the FFR cases performed at Kaiser Permanente Medical Center in Santa Clara, CA over a two-year period. Outcomes of the deferral center were compared to a reference center.

Results: FFR was performed on 219 patients with a total of 224 intermediate coronary lesions from a total of 32 patients returned for subsequent coronary angiography. Reasons for repeat angiography included post-cardiac transplant surveillance, stable angina, unstable angina, or MI. Of the 32 patients, 10 patients (7.1% of total deferred FFR patients) underwent revascularization of the originally deferred lesion, with 8 undergoing PCI and 2 undergoing CABG surgery. Average length from deferral to subsequent revascularization was 257 days. None of the originally deferred lesions resulted in a late MI or in-hospital death out to two years of follow-up.

Conclusions: Fractional flow reserve assessment has been increasingly adopted at our cardiac referral center and accounted for 3.9% of patients that underwent coronary angiography over the initial two years of adoption. FFR-guided therapy yielded outcomes that were comparable to that seen in the FAME study, with 7.1% of deferred lesions requiring revascularization and no deferred stenosis resulting in a subsequent MI or in-hospital death.

TCT-228

Coronary Endothelial Dysfunction Predicts Long-term Prognosis In Patients With Successful First Generation Drug-eluting Stents Implantation Without Residual Stenosis At Chronic Stage

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Background: It is not well known whether endothelial dysfunction after drug-eluting stent (DES) implantation affects the prognosis. Purpose: We tried to find the predictors of cardiovascular events after successful DES implantation.

Methods: A consecutive 122 patients who underwent successful first generation DES (Cypher, Cordis Corp., Miami Lakes, Florida and Taxus, Boston Scientific, Natick, Massachusetts) implantation and had no residual stenosis at follow-up coronary angiography (CAG) were included. All patients also underwent acetylsalicylic acid provocation test (ACH) at follow-up CAG. Definition of positive ACH test (ACH+) was >90% stenosis with symptom and ischemic electrocardiographic change. Age, sex, coronary risk factors (smoking, hypertension, diabetes mellitus, dyslipidemia), medication (calcium channel blockers, angiotenin receptor blockers, angiotenin converting enzyme inhibitors, nitrates, fblockers, statins), duration from stent implantation to follow-up CAG (155±14.5 months), old myocardial infarction, ACH+ were included as variables for multivariate analysis for cardiovascular events (angina pectoris without intervention, acute myocardial infarction, definite or probable stent thrombosis, cardiac death, and stroke).

Results: ACH provocation test was positive in 64.8%. The following events occurred during mean follow-up period of 26.9±9.5 months; angina pectoris without intervention in 12, very late stent thrombosis in 1, acute myocardial infarction in 1, sudden death in 1, and stroke in 4. Table shows the results of multimonial Cox and logistic regression models. Since data of ACH did not fit the conditions of a proportional Hazard model, it used multimonial logistic regression.

Independent Predictors of Cardiovascular Events after first generation DES Implantation

Table 1

<table>
<thead>
<tr>
<th>Parameter</th>
<th>LMCA N=30</th>
<th>Proximal epicardial N=30</th>
<th>p value</th>
<th>Epicardial N=255</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average LA (mm²)</td>
<td>15.2±3.9</td>
<td>10.0±3.8</td>
<td>&lt;0.001</td>
<td>8.5±3.6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Average plaque area (mm²)</td>
<td>7.4±2.8</td>
<td>6.3±3.0</td>
<td>0.085</td>
<td>5.3±2.9</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>PAV</td>
<td>32.6±8.0</td>
<td>38.4±14.1</td>
<td>0.059</td>
<td>37.0±13.6</td>
<td>0.09</td>
</tr>
<tr>
<td>Average EEM area (mm²)</td>
<td>22.6±5.4</td>
<td>16.4±4.5</td>
<td>&lt;0.001</td>
<td>13.8±4.9</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>EI</td>
<td>3.2(2.9,3.9)</td>
<td>6.7(3.9,3.9)</td>
<td>0.001</td>
<td>5.2(3.7,3.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>% change in LA Within segment p-value</td>
<td>0.10±1.8 (0.98)</td>
<td>4.20±2.1 (0.91)</td>
<td>0.59</td>
<td>3.3±0.77 (&lt;0.001)</td>
<td>0.17</td>
</tr>
</tbody>
</table>

Results:

- Cox hazard model:
  - Age: Hazard ratio 1.062, 95.0% CI: 1.010-1.117, p = 0.020.
  - Duration after DES implantation: 1.03, 1.003-1.057, p = 0.026.
- Multinomial logistic model:
  - ACH test positive: Odds ratio 1.01, 0.97-1.052, p = 0.637.

Conclusions: Coronary endothelial dysfunction evaluated by ACH provocation test at stable stage is the strongest predictor of further prognosis in patients with first generation DES.
Conclusions: This study suggests that intracoronary nicorandil administration might be safely and feasible compared to intravenous ATP infusion for FFR measurements.

**TCT-230**

Instantaneous wave-Free Ratio (iFR) and Gradient (iFG): new promising adenosine-independent alternative to fractional flow reserve. Preliminary results from the FORECAST Study

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Background: The assessment of non-culprit stenoses is an important issue in ACS. Adenosine administration is currently required for functional evaluation of stenosis severity using fractional flow reserve (FFR). An alternative adenosine-independent index of coronary stenosis, the instantaneous wave-free ratio (iFR), was recently introduced. Aim of the present study was to evaluate the trans-stenotic instantaneous wave-free pressure gradient (iFG), the instantaneous wave-free ratio (iFR) and the fractional flow reserve (FFR) in ACS patients.

Methods: Intracoronary diastolic pressure was measured proximal and distal to the stenosis during the wave-free period with a pressure wire (Certus, St. Jude, USA) at baseline and upon iv adenosine administration (140 ug/kg/min). The data were acquired with a PowerLab (AD Instruments, USA) and analyzed with a LabChart 7.

Results: A total of 71 stenoses were evaluated in the present study. iFR showed a correlation with FFR (r=0.61, p<0.001), while a proportional error was documented with MLA (AUC 175.0, p<0.001) or iFG (AUC 175.0, p<0.001).

Interestingly, iFR showed a sensitivity of 88.2% and a specificity of 75.9%, when the severity of the stenosis within the coronary tree influenced the correlation of iFR with FFR (p=0.001). A poor correlation was observed between FFR and MLA or percentage area stenosis (r=0.13). A poor correlation was observed between FFR and MLA or percentage area stenosis (r=0.13). A poor correlation was observed between FFR and MLA or percentage area stenosis (r=0.13).

Conclusions: The instant wave-free ratio (iFR) and the resting distal-to-proximal pressure gradient measured during the wave-free period (iFG) showed a good diagnostic performance for the assessment of non-culprit lesions in ACS, representing a promising and adenosine-independent alternative to standard fractional flow reserve (FFR).

**TCT-231**

Investigation of Fractional Flow Reserve Correlation with Direct Anatomical Parameters Using a Percutaneous Model of Coronary Artery Stenosis

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Background: Vessel Minimum Lumen Area (MLA) is generally considered a critical parameter for PCI guidance. Recently the relevance of anatomical based criteria has been questioned as their correlation with functional measures such as pressure based Fractional Flow Reserve (FFR) remains modest. In patients, analyzing such correlation can be however challenging as not only lesion severity but general atheroma burden and diseased myocardium can also alter physiological response. We developed here a porcine-percutaneous model of coronary stenosis to delineate the interaction of different anatomical parameters on FFR.

Methods: We developed a series of percutaneous stenotic stent models, mimicking intermediate to severe stenosis, and implanted them in coronary arteries of 8 healthy hybrid landrace pigs. Optical Coherence Tomography (OCT) pullbacks and Fractional Flow Reserve (FFR) were acquired along the artery after implantation of the stenotic stent.

Results: Average MLA after deployment of the stenosis implant was 1.7 ± 0.5 mm² ranging from 1.0 to 2.7 mm² (95% CI: 1.3-1.9). Area stenosis ranged from 69.1% up to 84.0 % with an average area stenosis of 78.4 ± 5.8 %. Average FFR value was 0.83 ± 0.13. A poor correlation was observed between FFR and MLA or percentage area stenosis evaluated by OCT (respectively r = 0.02, p = 0.94 and r = -0.35, p = 0.12). On the other hand, a severity OCT evaluation based on a volumetric percentage stenosis taking into account not only the MLA, but also the length of the lesion, resulted in significant better correlation with FFR (r = -0.78, p = 0.01).

Conclusions: We present in this study a controlled in-vivo model to evaluate the impact of focal stenoses on physiological assessment. Initial results using this model suggest that a lesion assessment based on parameters taking into account both length and area severity may provide a better anatomical parameter than simple MLA or percentage area stenosis for assessment of lesion severity by intravascular imaging.

**POSTERS**

**TCT-232**

Left Ventricular Filling Pressures Affect Measurements of Fractional Flow Reserve

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1Emory University, Atlanta, GA, 2Medical University of South Carolina, Charleston, SC

Background: Fractional flow reserve (FFR), the hyperemic ratio of distal (Pd) to proximal (Pa) coronary pressure, is used to identify the need for coronary revascularization. Changes in left ventricular end-diastolic pressure (LVEDP) might affect measurements of FFR. The effect of changing LVEDP on FFR measurement is unknown.

Methods: LVEDP was recorded simultaneously with Pa and Pd during conventional measurement of FFR and during an additional, intravenous infusion of nitroprusside. The relationship between LVEDP and FFR was assessed using linear mixed models with a random intercept.

Results: Prospectively collected data for 528 cardiac cycles from 20 coronary arteries in 17 patients were analyzed. Mean Pa, Pd, FFR, and LVEDP were 73 mmHg, 51 mmHg, 0.71, and 18 mmHg, respectively. FFR<0.80 was present in 14 arteries (70%). With nitroprusside mean Pa, Pd, FFR, and LVEDP were 62 mmHg, 43 mmHg, 0.70, and 13 mmHg, respectively. In a multivariable model for the entire population LVEDP was positively associated with FFR such that for every 1-mmHg increase in LVEDP the measured FFR increased by 0.003 (beta=0.003, p<0.001). The association between LVEDP and FFR was more pronounced in obstructed arteries with FFR<0.80 (beta=0.005; p<0.001) and was absent in non-obstructed arteries with FFR>0.80 (beta=0.000, p=0.84).

Conclusions: In this population of coronary arteries with mean FFR = 0.71, LVEDP was positively associated with FFR. The association of LVEDP with FFR was more pronounced in obstructive disease. These findings may have implications for the use of FFR in patients with heart failure and coronary artery disease.

**TCT-233**

Abstract Withdrawn

**TCT-234**

Prediction of fractional flow reserve using contrast media flow data under vasodilatation and the parameters of 3D coronary angiography

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Background: The fractional flow reserve (FFR) shows the reduction of the maximal achievable flow through the stenosis of a coronary artery. Its value is determined by the...