**Table 1. Comparison of CTA and 3D-TEE Measurements**

<table>
<thead>
<tr>
<th></th>
<th>CTA</th>
<th>3D-TEE</th>
<th>Mean difference</th>
<th>P-value</th>
<th>R*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perimeter (mm)</td>
<td>78.9 ± 8.2</td>
<td>78.0 ± 7.0</td>
<td>0.9 ± 1.6</td>
<td>0.14</td>
<td>0.99</td>
</tr>
<tr>
<td>Area (mm²)</td>
<td>476 ± 100</td>
<td>470 ± 88</td>
<td>6 ± 19</td>
<td>0.39</td>
<td>0.99</td>
</tr>
<tr>
<td>Maximum diameter (mm)</td>
<td>27.4 ± 3.1</td>
<td>26.8 ± 2.9</td>
<td>0.6 ± 1.7</td>
<td>0.28</td>
<td>0.85</td>
</tr>
<tr>
<td>Minimum diameter (mm)</td>
<td>21.7 ± 2.7</td>
<td>22.4 ± 2.4</td>
<td>0.8 ± 1.4</td>
<td>0.13</td>
<td>0.86</td>
</tr>
</tbody>
</table>

*All p-values for correlation are significant.*

**Conclusions:** Annular measurements from a 20 cc CTA protocol were statistically equivalent to a validated standard of 3D-TEE measurements. A very low dose protocol may play a very important role in pre-TAVR assessment for patients at high risk of CIN.

**TCT-670**

Volume and distribution of aortic valve calcium and implications for aortic regurgitation after transcatheter aortic valve implantation

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**Background:** The purpose of this study was to measure volume and distribution of aortic valve calcium using multislice computed tomography (MSCT) and to define whether they predict paravalvular regurgitation (PAR) after transcatheter aortic valve replacement (TAVR).

**Methods:** A total of 263 patients underwent TAVR between August 2008 and September 2013. The MSCT scans were analyzed for the volume and distribution of calcium. Leaflet calcium volume and asymmetry index (maximum leaflet calcium volume – minimum leaflet calcium volume)/sum of maximum and minimum leaflet calcium volume) were scored. Correlation between aortic valve calcium volume and asymmetry index with post-procedural PAR on discharge transthoracic echocardiography was investigated.

**Results:** Forty-six percent of patients had no or trivial PAR (grade less than 1). 46% had mild PAR and 8% moderate to severe. The volume of annular calcium was higher in patients with mild or moderate to severe PAR compared to patients with PAR grade less than 1 (2023.1±916.4 μl, 2270.8±1558.3 μl and 1709.9±976.9 μl respectively, p=0.024). No association was found between aortic valve calcium asymmetry and PAR severity. Multivariate analysis, including aortic valve leaflet calcium volume, asymmetry index of calcium distribution, and other factors that might be associated with PAR (among others aortic annulus area and valve prosthesis type) showed aortic valve calcium volume as the only independent predictor of PAR severity (B=0.00034, p=0.019).

**Conclusions:** Increasing volume of aortic valve calcium predicts the severity of PAR after TAVR. Asymmetrical distribution of calcium in the aortic valve apparatus is not correlated with the severity of PAR after TAVR.

**TCT-671**

Assessment of the Geometric Interaction Between the Lotus Transcatheter Aortic Valve Prosthesis and the Native Aortoventricular Interface by 3D-Slice Multidetector Computed Tomography

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**Background:** The LOTUS (Boston Scientific, MA, USA) device is a mechanically expanded, reselectable and repositionable transcatheter aortic valve prosthesis. Post-implantation imaging studies of first generation TAVR devices have demonstrated variable geometric interactions with the native annulus. We sought to assess the geometric interaction between the novel LOTUS device and the native aortoventricular interface by multi-detector CT (MDCT) imaging.

**Methods:** 14 patients (28.6% male, mean age 83±5.0yrs) who received a LOTUS device underwent MDCT imaging prior to and 12 months post implantation. Baseline measurements were made at the level of the LVOT, basal plane (BP), SOV and ascending aorta. Prosthesis dimensions (height, minimum and maximum diameters, perimeter and area) were measured on post implantation scans at three levels. The eccentricity index (EI=1−Dmm/Dmax)) and expansion ((measured area/expected area) x 100) of each prosthesis was calculated.

**Results:** The mean eccentricity was 0.05±0.04 in the inflow segment, 0.04±0.04 in the mid segment and 0.03±0.02 in the outflow segment. 3D-TEE circular (EI>10). There was no statistically significant difference in baseline eccentricity to account for non-circular deployment (BP EI=0.25±0.05 vs 0.23±0.04, p=0.60; LVOT EI=0.41±0.07 vs 0.32±0.10, p=0.15). The mean expansion in the inflow, mid and outflow segments were 101.8±8.9%, 95.9±11.2% and 101.9±11.2%. 1 prosthesis was under-expanded in the mid segment, percent expansion 83%. This prosthesis was significantly more oversized than the other devices (perimeter oversizing 18.1% vs 1.8±5.9%, p=0.02; area oversizing 51.6% vs 10.5±12.9%, p=0.01). The average implantation depth was 3.5±0.6mm. In 9 cases (64.3%) the frame extended above the ostium of the LMCA. In these cases there was significant residual sinus area surrounding the frame area (208.7±92.0mm²) and distance between the frame and origin of the coronary artery (5.2±1.6mm).

**Conclusions:** The LOTUS TAVR device, with its unique mechanism of deployment, results in high rates of circularity and nearly full expansion. Significant prosthesis oversizing may result in modest under-expansion that has not been shown to impact on valve function.

**TCT-672**

Relationship between atheroma of the thoracic aorta and risk of stroke in patients undergoing transcatheter aortic valve implantation

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**Background:** Clinically relevant stroke is a severe complication after transcatheter aortic valve implantation (TAVI) and occurs in up to 10% of cases. The objective of this study was to assess the relationship between severity of calcification of the thoracic aorta and the aortic valve and stroke after TAVI.

**Methods:** Multislice computed tomography (MSCT) of the thoracic aorta of the thoracic aortic arch and ascending aorta, arch and descending aorta measuring the Agatston score (AgSc) and plaque size. Physical examination and cerebral imaging assessed patients with stroke.

**Results:** Stroke occurred in 9 (6.4%) patients. Patients with stroke had higher values of AgSc in the arch (9309±6048 vs. 9111±3335; p=0.01) and larger plaque size in the arch (4.8±1.7 mm vs. 3.4±1.2 mm; P=0.006). AgSc of the descending aorta (6333±4834 vs. 3172±2910; P=0.06) was numerically higher in patients suffering a stroke. There was no difference in calcification of the aortic valve (2688±2177 vs. 2272±1518; (P=ns) and ascending aorta (1569±1486 vs. 1673±2492; P=ns) in both groups. Multiple regression analysis identified AgSc and maximum plaque size of the arch, reduced left ventricular ejection fraction and fluoroscopy time as independent risk factors for stroke.

**Conclusions:** Calcification of the aortic arch but not of the native valve is an independent predictor of stroke after TAVI. Precise preoperative screening may lead to optimized outcome in these patients.

**TCT-673**

Transcatheter Aortic Valve Oversizing: A Comparison of Leaflet Stress and Strain Distribution

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**Background:** Transcatheter aortic-valve replacement (TAVR) is the recommended treatment option for patients with severe aortic stenosis who are not suitable candidates for surgery. The current guidelines for TAVR are to upsize the valve relative to the native annulus to secure the device and minimize paravalvular leakage. However, incomplete TAV expansion due to oversizing negatively impacts valvular hemodynamics and distorts leaflet coaptation. The aim of this study was to determine the impact of valve oversizing on leaflet stress and strain distribution.

**Methods:** 3D leaflet geometry of a 23mm TAV expanded to diameters ranging from 18 to 23mm was obtained in 1mm increments. The TAV design was based on Edwards SAPIEN XT valve design. A large deformation analysis was performed using ABAQUS. Leaflets were only modeled and stent was considered to be rigid. A polynomial strain-energy function was fitted to biaxial data of each individual leaflet. An ensemble averaged transvalvular pressure waveform measured from in-vitro tests was applied to the leaflet.

**Results:** In a fully-expanded configuration, both high stress and large deformation were observed primarily in the commissure and basal attachment regions. The maximum principal stress value in the fully closed position was 1.8MPa (Fig 1A). Valve oversizing induced localized high stress regions within the belly of the leaflet. The maximum principal stress value in the fully closed position was 1.8MPa (Fig 1B).
Conclusions: We found that leaflets stress is dependent on the internal diameter of the inflated TAV. TAV oversizing induced localized high stress regions within the leaflets which may lead to premature tissue failure.

TCT-674
A novel way to calculate the line of perpendicularity and suitable angulations in TAVI by CT analysis
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Background: The line of perpendicularity (LOP) represents all C-arm angulations that give an orthogonal view to the aortic annulus plane. Three of these are called “implanter’s views” (IVs) as they are reasonable for implantation with one of the cusps being projected just in the middle of the two others. Our method allows a CT-based prediction of the LOP and IVs prior to TAVI.

Methods: 275 patients’ CT scans were analyzed with multi planar reconstructions prior to TAVI. The cusps’ lowest points were determined to define the annulus plane. The 3D coordinates of the hinge points were used to calculate the IVs and LOPs by using vector mathematics. All results were transferred into the common used LAO/RAO and cranial/caudal notation. Differences between angulations were quantified by calculation of solid angles that give the “real world”-deviation by combining LAO/RAO and cranial/caudal changes. All implantations were performed in the projection with the right-coronary cusp in front and middle of the two others.

Results: Predicted angulations were considered perfect for implantation without any corrections in 97.5% (n=268) of the procedures. In case of 7 patients, one (n=6) or two (n=1) corrections with following new angiograms were made. In these, the maximum difference between predicted and final angiograms was 14° (mean 6.2, ±5°). Inter-individual variation was 40° to -28° in the LAO/RAO and 31° to -35° in the cranial/caudal axis.

Conclusions: Our method allows precise prediction of suitable C-arm angulations for TAVI. As inter-individual variation is broad, we recommend to predict angulations in each single TAVI case.

TCT-675
Comparison of Novel Centerline Versus Traditional Line of Perpendicularity Approaches for Determination of Optimal C-Arm Projection in Transcatheter Aortic Valve Replacement
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1Lenox Hill Hospital, New York, NY; 2Lenox Hill Heart and Vascular Institute-North Shore LJI Health System, New York, NY; 3Philips Healthcare, Andover, MA; 4Lenox Hill Heart & Vascular Institute, New York, NY; 5Lenox Hill Hospital Professor of Cardiology in Pediatrics and Medicine, New York, United States

Background: Procedural success of TAVR depends upon accurate device positioning. Study aim was to determine if corresponding c-arm angulations for TAVR utilizing a novel method of predicting angiographic deployment projections, centerline (CL), is more predictive of post-TAVR implant angulation than line of perpendicularity (LoP), the gold-standard.

Methods: 53 patients for TAVR underwent ECG-gated cardiac CTA performed prior to implantation with 20 patients having post-TAVR CTA. Determination of aortic annular plane (AA) with appropriate c-arm angulations was performed using 2 methods (HeartNavigator, Philips, Netherlands): LoP based on AA created from base of the coronary cusps; CL based on adjusted AA generated from a CL through the aortic root using a volume-rendered reconstruction. Cranio-caudal position was recorded, pre-TAVR, for each 10° increment of RAO and LAO where C-arm is perpendicular to AA determined by both approaches, as well as post-TAVR utilizing the basal plane of the CoreValve.

Results: Mean pre-TAVR deployment c-arm angulations assessed using the LoP and CL were calculated and plotted (Figure A; paired t-test, p<1). A strong correlation was observed between pre- and post-TAVR c-arm deployment projections using the CL when compared to the LoP approach (Figure B).