Conclusions: Our results confirm previously reported incidences of 1-2 % of PIE post-TAVI. Despite early and aggressive therapy TAVI-PIE is associated with a very high mortality.

TCT-110
Lower risk of severe acute kidney injury in transcatheter aortic valve replacement: intracardiac echocardiography lowers radiocontrast medium requirements

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Background: This study sought to evaluate if a new guiding strategy for transcatheter aortic valve replacement (TAVR) aiming at minimizing the amount of radiocontrast agent can prevent acute kidney injury (AKI). AKI can increase mortality after TAVR and the association between AKI and radiocontrast agent volume is well documented.

Methods: Sixty patients with severe aortic valve stenosis scheduled for TAVR were randomized to either undergo TAVR guided by angiography (group 1; n = 30) or by multimodality imaging primarily based on intracardiac echocardiography (ICE) (Figure) (group 2; n = 30). AKI was defined and staged according to the VARCH criteria.

Results: Contrast volumes were markedly smaller in group 2 (mean Δ -61.9 ml (95% CI -70.6 to -53.3)). Serum creatinine levels were lower and eGFR was higher in group 2 on days three and 30 (p < 0.05). AKI occurred in 6 (20%) group 1 and in 11 (37%) group 1 patients (OR = 0.43 (95% CI 0.14 to 1.38)) with a trend toward a lower risk in group 2 (p < 0.05). The risk of severe AKI was lower (OR = 0.47 (95% CI 0.36 to 0.62)), the in-hospital stay was shorter (mean Δ -3.7 days (95% CI -5.7 to -1.6)), and the complication rate was not higher (OR = 0.46 (95% CI 0.10 to 2.05)) in group 2.

Conclusions: An ICE-based guiding technique reduces severity and probably rate of AKI in TAVR. This is due to reduction of the amount of radiocontrast medium. The approach does not increase procedural risks.

TCT-111
A Fully-Coupled Fluid Structure Interaction Simulation of Transcatheter Aortic Valve: Implication for Long-Term Valve Durability

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Background: Transcatheter aortic valve (TAV) replacement has emerged as the treatment of choice in non-operable patients with severe symptomatic aortic stenosis and an effective alternative to surgical valve replacement in high surgical risk patients. Proper evaluation of transcatheter valve long-term durability is critical for potential expansion of this technology to lower risk patients. The objective of this study was to develop the first fully coupled fluid-structure interaction (FSI) simulation of a transcatheter valve under physiologic condition to determine strain and stress distribution on the leaflets critical to assessing valve integrity and long-term durability.

Methods: TAV leaflet geometry used in this study was obtained based on the 23mm Edwards SAPIEN XT valve. FSI simulation was performed using ANSYS Fluent and Mechanical co-simulation coupling in ANSYS Workbench. The blood flow was modeled with a Newtonian Fluid using the k-ε turbulence model which is capable of modeling laminar, transitional and fully-turbulent flow. The TAV leaflets were modeled with the Mooney-Rivlin hyper-elastic material model. A custom-built pulse duplicator was utilized to validate FSI simulation. Flow field was validated using phase-locked particle image velocimetry (PIV) measurements. Furthermore, leaflet motion and deformation was measured by tracking the displacements of small markers placed in the central region of TAV leaflets.

Results: FSI results compared favorably to the measured experimental data. Qualitatively the velocity flow field from the simulation compared similarly to what was observed in the PIV measurements with a maximum velocity of 0.9 m/s. The pressure gradient across the valve was 9.1 mm-Hg which was comparable to the experimental data. Furthermore, a good correlation between the experimental and simulation results in terms of leaflet motion and deformation was achieved.

Conclusions: The developed fully-coupled FSI simulation allows for a quantitative analysis of strain and stress distribution on TAV leaflets necessary to assess long-term durability of TAVs. The computational model could be an enabling tool for TAV design improvements.

TAVR - Outcomes

Moscone West, 2nd Floor, Room 2008

Tuesday, October 29, 2013, 1:00 PM–3:15 PM

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TCT-112
Left Ventricular Ejection Fraction Improves Less after Trans-Apical Transcatheter Aortic Valve Replacement Compared to a Trans-Femoral Approach

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Background: Quality of life is lower after transapical transcatheter aortic valve replacement (TA-TAVR) as compared to surgical aortic valve replacement (SAVR) and transfemoral TAVR (TF-TAVR). We investigated whether changes in left ventricular ejection fraction (LVEF) might explain these differences.

Methods: Echocardiography-derived LVEF and other variables were compared at baseline, 1 month and 6 months after TF-TAVR, TA-TAVR and SAVR in patients enrolled in the PARTNER (Placement of Aortic Transcatheter Valves) Trial (Cohort A and B) and the non-randomized continued access registry.

Results: In total, 1,021 patients underwent TF-TAVR, 1,107 TA-TAVR and 305 SAVR. The mean LVEF in the TA-TAVR and SAVR groups increased significantly from baseline to 30 days by 3% (52±13% to 55±12%; p<0.001 for TF-TAVR and 53±12% to 56±11%; p=0.03 for SAVR). The mean LVEF in the TA-TAVR group did not change (53±12% to 53±12%; p=0.18). In patients with a baseline LVEF<45%, there was a significant 1% decrease in LVEF from baseline to 6 months in the TA-TAVR group (58.8±6.3% to 57.8±7.6%, p<0.001) compared to no change in the TF-TAVR group (59.4±6.2% to 59.7±7.2%, p=0.991). In those patients with a baseline LVEF<45%, there was a significantly greater increase in the LVEF in the TF-TAVR group as compared to the TA-TAVR patients (12±9% vs. 8±11%, p=0.002). Moderate or severe paravalvular aortic regurgitation was significantly more frequent at 6 months in the TF-TAVR group as compared to the TA-TAVR group (14.8% vs. 6.9%, p<0.001).

Conclusions: In patients with severe aortic stenosis, there is blunted improvement in LVEF after TA-TAVR as compared to TF-TAVR or SAVR. This finding may have important implications when considering non-transfemoral approaches for TAVR, such as a direct transaortic approach.