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USING 3D PRINTED MODELS FOR PLANNING TRANSCATHETER AORTIC VALVE IMPLANTATION IN PATIENTS WITH BICUSPID AORTIC VALVE

Poster Contributions
Poster Hall, Hall A/B
Saturday, March 10, 2018, 3:45 p.m.-4:30 p.m.

Session Title: Aortic Valve Disease: TAVR, Procedural Planning and Techniques
Abstract Category: 17. Interventional Cardiology: Aortic Valve Disease
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Background: Preoperative planning for transcatheter aortic valve implantation (TAVI) on bicuspid aortic valve (BAV) is challenging. We hypothesize that simulating TAVI on patient-specific 3D printed BAV can predict paravalvular leak (PVL), which may be associated with nonuniform annulus deformation upon valve deployment.

Methods: Patients with BAV and severe symptomatic aortic stenosis undergoing TAVI (n=5; age=77±4y, 4 men) were retrospectively studied. Patient-specific BAV models derived from computed tomography (CT) were 3D printed using digital materials with mechanical properties chosen to mimic valve tissue and calcified lesion. CT scans of the 3D printed models were performed after simulated TAVI using CoreValve. The pre- and post-implant models were compared for 3D geometrical mismatch to quantify annular deformation. Annular bulge index was derived according to deformation uniformity. Location and severity of PVL after the actual TAVI procedure were compared to that predicted by the bulge index.

Results: Post-TAVI PVL occurs in 4 patients. Annular bulge index accurately predicts PVL in 4 out of 5 cases (AUC= 0.748). In cases with PVL, location of maximal annular bulge index (colour-coded red) accurately predicts PVL location (Figure) whereas case with no PVL indicated no localized bulging.

Conclusion: Annular bulge index derived from simulated valve implantation on 3D printed models is a reliable indicator of post-TAVI PVL in BAV.