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Vortex dynamics in Patient-Specific Stenotic Tricuspid and Bicuspid Aortic Valves pre- and post- Trans-catheter Aortic Valve Replacement[1] HODA HATOUM, LAKSHMI PRASAD DASI, Ohio State Univ - Columbus — Understanding blood flow related adverse complications such as leaflet thrombosis post-transcatheter aortic valve implantation (TAVI) requires a deeper understanding of how patient-specific anatomic and hemodynamic factors, and relative valve positioning dictate sinus vortex flow and stasis regions. High resolution time-resolved particle image velocimetry measurements were conducted in compliant and transparent 3D printed patient-specific models of stenotic bicuspid and tricuspid aortic valve roots from patients who underwent TAVI. Using Lagrangian particle tracking analysis of sinus vortex flows and probability distributions of residence time and blood damage indices we show that (a) patient specific modeling provides a more realistic assessment of TAVI flows, (b) TAVI deployment alters sinus flow patterns by significantly decreasing sinus velocity and vorticity, and (c) relative valve positioning can control critical vortex structures that may explain preferential leaflet thrombosis corresponding to separated flow recirculation, secondary to valve jet vectoring relative to the aorta axis. This work provides new methods and understanding of the spatio-temporal aortic sinus vortex dynamics in post TAVI pathology.

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