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Transcatheter valve implantation can alter fluid flow fields in aortic sinuses and ascending aorta NEELAKANTAN SAIKRISHNAN, AJIT YOGANATHAN, Georgia Institute of Technology — Transcatheter aortic valves (TAVs) are valve replacements used to treat aortic stenosis. Currently, these have been used in elderly patients at high-risk for open-heart procedures. Since these devices are implanted under fluoroscopic guidance, the implantation position of the valve can vary with respect to the native aortic valve annulus. The current study characterizes the altered hemodynamics in the aortic sinus and ascending aorta under different implantation (high and low) and cardiac output (2.5 and 5.0 L/min) conditions. Two commonly used TAV designs are studied using 2-D Particle Image Velocimetry (PIV). 200 phase locked images are obtained at every 25ms in the cardiac cycle, and the resulting vector fields are ensemble averaged. High implantation of the TAV with respect to the annulus causes weaker sinus washout and weaker sinus vortex formation. Additionally, the longer TAV leaflets can also result in a weaker sinus vortex. The level of turbulent fluctuations in the ascending aorta did not appear to be affected by axial positioning of the valve, but varied with cardiac output. The results of this study indicates that TAV positioning is important to be considered clinically, since this can affect coronary perfusion and potential flow stagnation near the valve.

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