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Experimental assessment of valve performance in healthy and diseased right ventricular outflow tracts using magnetic resonance velocimetry NICOLE SCHIAVONE, CHRISTOPHER ELKINS, DOFF MCELHINNEY, JOHN K. EATON, ALISON MARSDEN, Stanford University — Tetralogy of Fallot (ToF), the most common type of cyanotic congenital heart defect, affects 1 in every 2500 newborns annually and typically requires surgical repair of the right ventricular outflow tract (RVOT) and placement of an artificial pulmonary valve. All artificial valves are subject to dysfunction, but their longevity is highly variable. Clinical observation reveals large variations in RVOT anatomy in ToF patients, which may affect longevity. This work aims to experimentally assess the performance of artificial pulmonary valves in anatomically realistic healthy and diseased RVOT geometries using magnetic resonance velocimetry (MRV). With MRV, we can capture 3D, three-component, phase-averaged velocity fields in 3D printed RVOT geometries. The experiment is designed to ensure physiological flow rate and pressure waveforms, while the RVOT geometries are based on anatomies seen clinically in ToF patients. Two models are used in the current work: an idealized RVOT based on healthy subjects aged eleven to thirteen and a diseased geometry with a dilation of 150% in vessel diameter downstream of the pulmonary valve. We will also present preliminary rigid-wall blood flow simulations in each model, towards the ultimate goal of experimental validation of valve simulations.

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