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Physiologic Simulation of the Fontan Surgery with Variable Wall Properties and Respiration CHRISTOPHER LONG, YURI BAZILEVS, UCSD, JEFFREY FEINSTEIN, Stanford University, ALISON MARSDEN, UCSD — Children born with single ventricle heart defects typically undergo a surgical procedure known as a total cavopulmonary connection (TCPC). The goal of this work is to perform hemodynamic simulations accounting for motion of the arterial walls in the TCPC. We perform fluid structure interactions (FSI) simulations using an Arbitrary Lagrangian Eulerian (ALE) finite element framework into a patient-specific model of the TCPC. The patient's post-op anatomy is reconstructed from MRI data. Respiration rate, heart rate, and venous pressures are obtained from catheterization data, and flowrates are obtained from phase contrast MRI data and are used together with a respiratory model. Lumped parameter (RCR) boundary conditions are used at the outlets. This study is the first to introduce variable elastic properties for the different areas of the TCPC, including a Gore-Tex conduit. Quantities such as wall shear stresses and pressures at critical junctions are extracted from the simulation and are compared with pressure tracings from clinical data as well as with rigid wall simulations.

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