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**Artificial Right Atrium Design for Univentricular Heart Patients**

HENG WEI, University of Southern California, CYNTHIA HERRINGTON, JOHN CLEVELAND, Children's Hospital Los Angeles, VAUGHN STARNES, NIEMA PAHLEVAN, University of Southern California — Infants born with single ventricle pose a large challenge. The Fontan operation for univentricular heart patients creates a unique circulation whereby systemic veins get connected to the pulmonary arteries without passing through the cardiac chambers. As getting older, individuals with single ventricle tend to develop long-term complications like heart failure and require heart transplant. Previous studies have attempted to mechanically support these patients with standard left ventricular assist devices (LVAD). The primary difficulty in establishing mechanical support for Fontan is that there is no blood reservoir in the closed Fontan circulation. An artificial right atrium is one of the treatments that could be implanted into the Fontan graft and provide a reservoir for blood and allow for full circulatory support. We investigated the optimum geometrical design of artificial right atrium by minimizing the particle residence time to reduce the chance of blood stagnation and clotting. Non-Newtonian Fluid-Structure Interaction (FSI) simulations employing Lattice-Boltzmann and immersed boundary method were utilized to evaluate Fontan hemodynamics. Our results indicate that the artificial atrium optimum shape is similar to the real human atrium.

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