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Stereoscopic PIV of Powered Fontan Hemodynamics in Idealized Total Cavopulmonary Connection (TCPC) ANNA-ELODIE KERLO, School of Mechanical Engineering, Purdue University, MARK RODEFELD, Indiana University School of Medicine, STEVEN FRANKEL, JUN CHEN, School of Mechanical Engineering, Purdue University — Stereoscopic Particle Image Velocimetry (SPIV) measurements are presented in an idealized TCPC geometry powered by a novel Viscous Impeller Pump (VIP) designed to provide mechanical assist to univentricular Fontan circulations. Instantaneous flow patterns and mean flow statistics are reported to provide insight into flow structure and wall shear stress. Dynamic mode decomposition is applied to SPIV data to extract relevant modes from the flow without and with the VIP present and operating. Previous experimental and computational studies showed excellent hemodynamic performance of the VIP: it stabilizes the four-way flow pattern without risk of obstruction to flow and augments flow in ideal pressure range (0-10 mmHg). This holds out the promises of providing temporary support for patients with failing Fontan circulations and ultimately reducing the 3-stage Fontan surgical procedures to one. Our SPIV data help to elaborate on VIP performance by analyzing detailed unsteady flow features and serve as a database for more advanced computational studies such as large eddy simulation.

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