Abstract Submitted
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Early embryonic intra-cardiac flow fields at three idealized ventricular morphologies[1] KEREM PEKKAN, MOHAMMAD JAMALY, BURAK KARA, Carnegie Mellon University, BRADLEY KELLER, University of Louisville, FOTIS SOTIROPOULOS, University of Minnesota — Pulsatile 3D multiple inlet/outlet flow within tiny (100-300μm dia) embryonic ventricles feature distinct intra-cardiac flow streams whose role in regulating the morphogenesis of spiral aorto-pulmonary septum has long been debated. The low Re number flow regimes limit mixing of these streams as replicated in our flow-visualization experiments with chick embryos. A state-of-the art high-resolution immersed boundary CFD solver which was developed for complex patient-specific cardiovascular internal flow problems is applied and optimized for this problem. Idealized tubular ventricles at 3 major embryonic stages (straight, C- and D- loops) are created by our sketch-based anatomical editing tool. CFD results are validated with PIV measurements acquired from a micro-fabricated C-loop stage replica and in vivo flow vis data from confocal microscopy. This model provided the inlet velocity profile for arterial models and flow fields at the inner curvature of embryonic hearts for different ventricular topologies are compared for off-design modes.

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