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Temporal FLOW EVOLUTION ON A PEDIATRIC VENTRICULAR ASSIST DEVICE

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Abstract **–** The transplant line is long and slow for patients with cardiac diseases, especially children. The support of ventricular assist devices (VAD) may stabilize the patient until a suitable donor is found. VADs are auxiliary pumps that help the failing heart to pump the blood. However, the use of a VAD is associated with clinical complications due to blood trauma (hemolysis) or thrombus formation. The destruction of the blood cells is strongly correlated with the shear stress that is imposed in the flow through all the devices parts, while regions of very slow velocities (stagnation) may increase the probability of thrombus formation. One particularly difficulty lies in pediatric devices due to strong variations in sizes and flows to accommodate children of various ages. To allow future improvement in the PVAD, the present work aims to analyze the temporal flow evolution inside a pulsatile pediatric ventricular assistance device (PVAD) under development in our institution. The time resolved particle image velocimetry technique was used to observe the evolution of flow structures inside the device. In this study, three parallel planes were studied to visualize the three-dimensionality of the flow. In the experiments, the acquisition rate was 3250 Hz and pumping rate set at 70 bpm. The results show important asymmetries in the filling and ejection periods especially near the valves.

Keywords**:** Particle image velocimetry, blood flow, Pediatric Ventricular Assist Device, Temporal evolution