

Blood flow characteristics in the ventricles and large vessels: calculations based on 4D MRI data and user-friendly software

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Magnetic resonance imaging (MRI) gives the opportunity to quantify time-resolved 3D flow patterns in vivo. However, its space and time resolution is limited thus compromising the accuracy of flow-based measurements and can cause significant discrepancies, especially when a flow derivative calculation is required. In previous investigations it was shown that the relative error of the shear stresses, calculated at a fixed moment of time with the use the space derivatives of the velocity components, can exceed 100 %. In turn, the time-averaged characteristics can be calculated with higher accuracy. In this project, we present original methods to estimate shear stresses and pressure gradients without using flow derivatives. The new algorithms are implemented in a new software tool, which is user-friendly and provides information along the whole vessel, between two selected cross-sections or in the proximity of selected points.