

Supplementary information for:

CSF dynamics throughout the ventricular system using 4D flow MRI: associations to arterial pulsatility, ventricular volumes, and age

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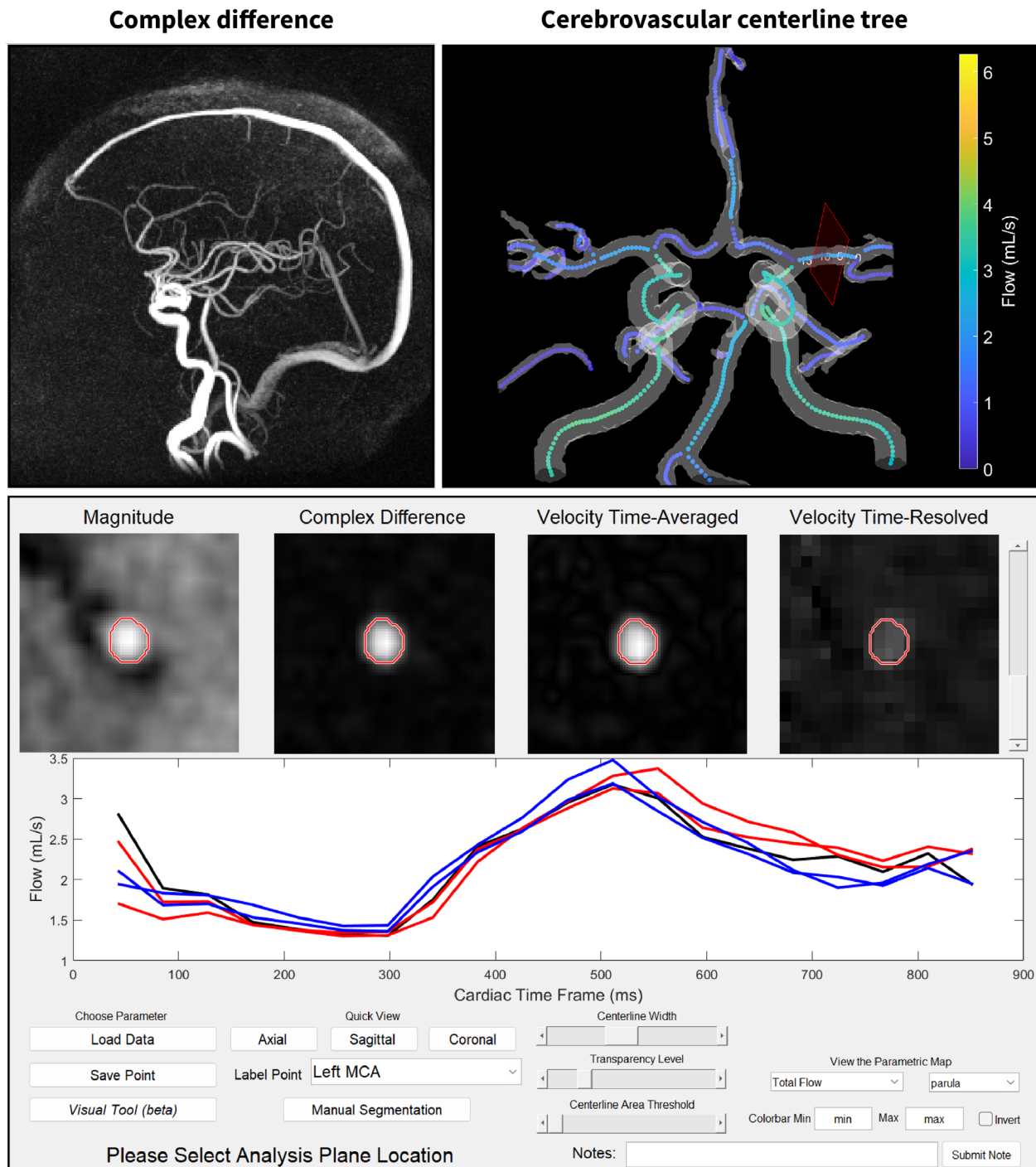
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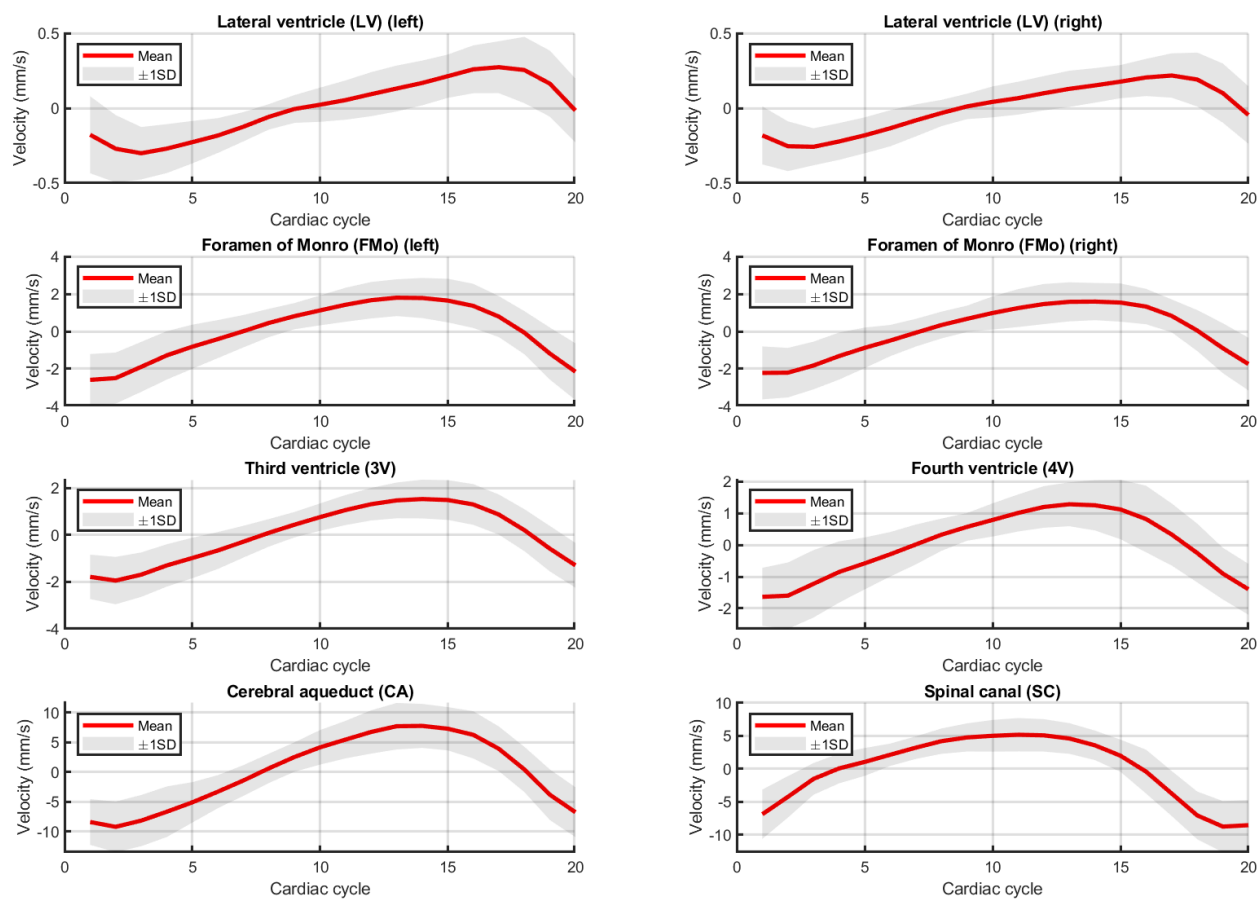
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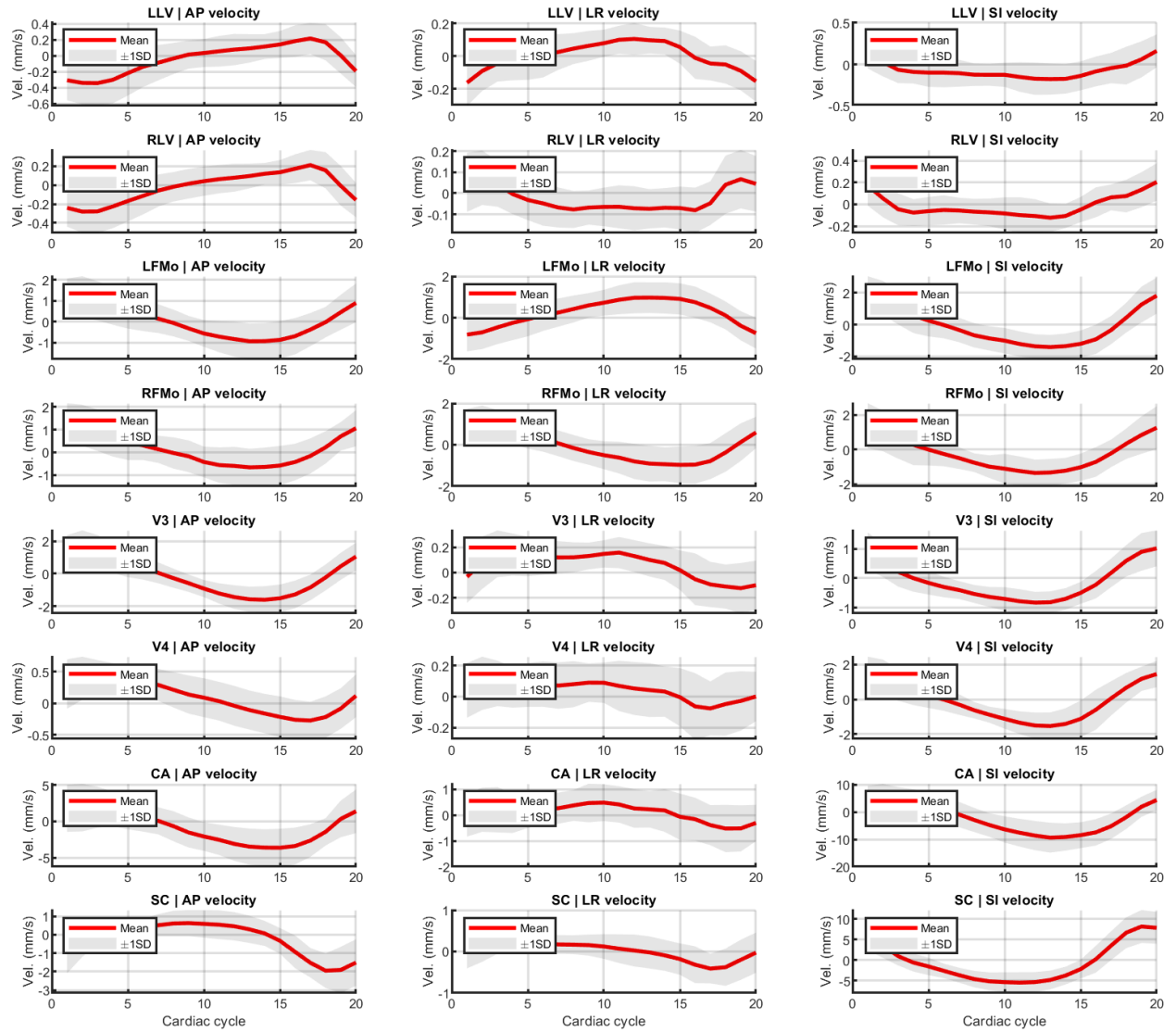
Sup. Fig. 1-5.



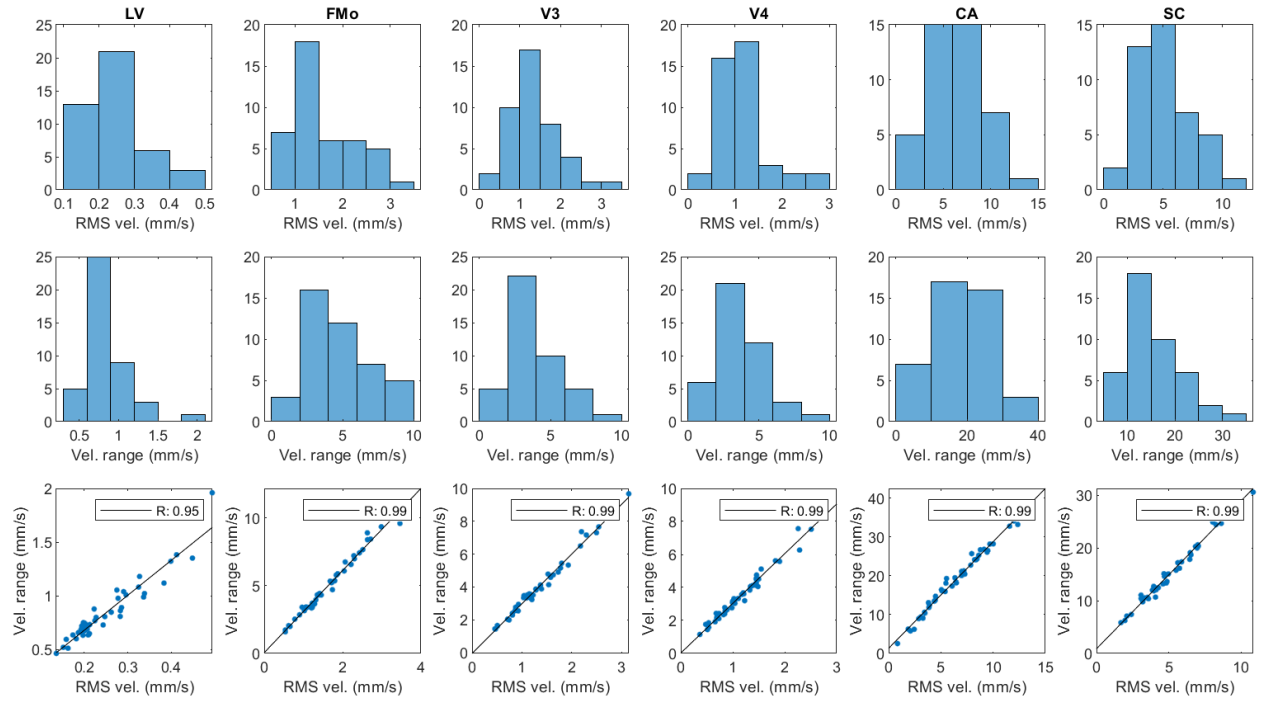
Sup. Fig. 1. Cerebral blood flow (CBF) dynamics in the middle cerebral artery (MCA) from an example PC-VIPR 4D flow MRI scan assessed by the quantitative velocity tool (QVT) (<https://github.com/uwmri/QVT>).



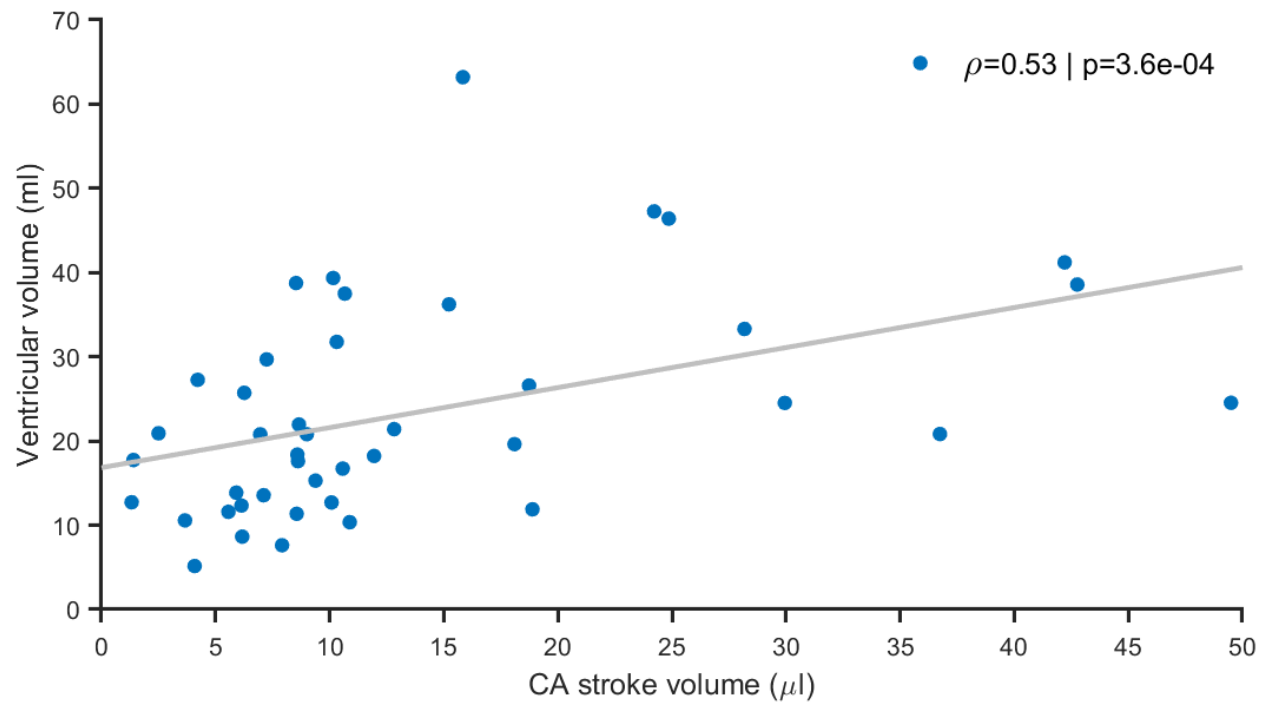
Sup. Fig 2. CSF velocity waveforms in all CSF ROIs averaged over the entire cohort (N=43), with patched regions representing ± 1 standard deviation (SD). The individual waveforms were obtained by the first principal component (PC1) when using waveforms from all voxels as input to the principal component analysis (PCA), i.e., no spatial averaging of velocity data was done before the PCA.



Sup. Fig. 3. Group-averaged cerebrospinal fluid (CSF) velocities in the anterior-posterior (AP), left-right (LR), and superior-inferior (SI) directions for all investigated CSF compartments. Individual AP, LR, and SI region-averaged waveforms were first obtained by averaging across all voxels within each ROI, and group-averaged waveforms were obtained from the individual AP, LR, and SI velocity waveforms. Patched regions correspond to ± 1 standard deviation (SD). LLV/RLV: left/right lateral ventricles, LFMo/RFMo: left/right foramen of Monro, V3: third ventricle, V4: fourth ventricle, CA: cerebral aqueduct, SC: spinal canal.



Sup. Fig. 4. Distribution of CSF velocities in various CSF compartments for the entire cohort (N=43). Scatter plots indicate very high correlations ($R=0.95$ for lateral ventricles; $R=0.99$ for other CSF spaces) between the velocity range (or amplitude) and root-mean-square (RMS) velocity. LV: left/right-averaged lateral ventricle; FMo: left/right-averaged foramen of Monroe; V3/V4, 3rd and 4th ventricles; CA, cerebral aqueduct; SC, spinal canal.



Sup. Fig. 5. Cerebral aqueduct (CA) stroke volume was positively correlated with lateral ventricles volume ($\rho=0.53$, $p<0.001$).