6th European Conference on Computational Mechanics (ECCM 6)
7th European Conference on Computational Fluid Dynamics (ECFD 7)
11-15 June 2018, Glasgow, UK

Assesment of "glymphatic" system using DTI, CSF tracer and finite element computation.

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Keywords: *Biomechanics, CSF tracers, Glymphatic*

The recently introduced concept glymphatic system hypothesize that waste clearance in the brain driven by convective bulk flow through the parenchyma [1]. Recent computational studies [2,3] questions the significance of the bulk flow. Intrathecal CSF [4] tracer provide the mean to quantity tracer transportation in the parenchyma, and in this we have undertaken to examine the transportations can be predicted by the apparent diffusion coefficient provided by diffusion tensor imaging in terms of finite element modeling.

We will use a control and a patient with a subtype of dementia called normal pressure hydrocephalusm. The MRI contrast agent gadobutrol, given intrathecally, was used as CSF tracer. Standardized T1 weighted MRI scans were performed before and at defined time points and until 24 hours, 48 hours and 4 weeks after intrathecal gadobutrol. The MRI scans were aligned and segmented using FreeSurfer, and change in T1 signals quantified as percentage change in normalized signal unit ratios over time. The finite element methods is used to calculate the tracer transportation in the parenchyma.

The study revealed significant enrichment of CSF tracer within all the examined brain regions. Finite element simulations suggest transportation faster than what can be explained by diffusion alone.

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