Abstract Submitted
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Numerical simulations and experiments of CSF flow in the spinal canal[1] CANDIDO GUTIERREZ-MONTES, Universidad de Jaen, WILFRIED COENEN, JENNA J LAWRENCE, Univ of California - San Diego, CARLOS MARTINEZ-BAZAN, Universidad de Jaen, ANTONIO L SANCHEZ, JUAN C LASHERAS, Univ of California - San Diego — Besides the oscillatory velocity driven by the cardiac and respiratory cycles, CSF flow in the spinal canal exhibits a slow steady Lagrangian motion comprising steady-streaming and Stokes-drift contributions, described in recent analytical work. Associated subject-specific descriptions of this bulk flow have revealed the existence of closed Lagrangian recirculating vortices in the lumbar, thoracic, and cervical regions. The structure of these vortices and their relevance in connection with intrathecal drug delivery (ITDD) applications are further investigated in the present study by transient numerical simulations employing a dynamic-mesh fluid-structure interaction method to account for the deformation of the dura membrane. The results show excellent agreement with the previous analytical predictions, which are further corroborated by accompanying in-vitro experiments. The description is extended to account for the buoyancy-driven motion emerging in ITDD procedures as a result of the density mismatch between the drug and the CSF.

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