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CFD Analysis in cerebral aneurysms

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Abstract Blood flow simulations have long been considered as a valuable tool for a deeper understanding of the physiopathology of intracranial aneurysms. Many authors built robust computational settings based on accurate computer-assisted registration, segmentation, and 3D geometry reconstruction from medical images of patient specific cerebral aneurysms, and special techniques to derive appropriate boundary conditions. However, an accurate description of flow mechanics in the near wall region and its connection with the evolution of the wall disease remains linked to several questions not yet fully understood. Recently, a lower order approximation of the Lagrangian dynamics in the near wall region, which allows for a meaningful characterization of both normal and parallel direction to the wall, has been suggested. We verify this computational approach with a cohort of brain aneurysms and try to provide a step further in the understanding of the hemodynamic environment and its possible connection with the risk of rupture. Possible ways to improve such techniques are also discussed.

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