

On the assumption of laminar flow in the modelling of physiological flow

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Physiological flow has moderate or low Reynolds number compared with many flow applications found in engineering. Therefore, many or perhaps most computational studies of physiological flow either explicitly or implicitly assume laminar flow for the purpose of simulations. In our talk we will consider this assumption more critically in the context of two pathologies: 1) blood flow in aneurysms and the flow of cerebrospinal fluid in the spinal canal in association with the Chiari I malformation. In both cases the Reynolds number is moderate, i.e. $Re < 1000$. However, the pulsatility of the flow and the complex geometries facilitate transition to turbulence at a far lower Reynolds number than the critical number of pipe flow ($Re 2300$). The transition might however often be dampened by under-resolving the flow or adding stabilization terms, and this may significantly alter the flow.