Numerical and experimental *in-vitro* analysis of blood flow through middle cerebral aneurysms

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Cerebral aneurysms are one of the most common cerebrovascular accidents and are the cause of one-third of deaths worldwide [1]. This kind of accidents starts with a dilatation of an artery usually occurring near arterial bifurcations in the Circle of Willis [2,3]. Despite growing progress, the initiation, growth and rupture of aneurysms are still not well understood. Computational Fluid Dynamics (CFD) has been progressively used for modelling the flow in diseased arteries and it is a tool of great potential for the diagnostic, prediction and treatment of cerebral aneurysms [4].
In this work we numerically and experimentally investigate the hemodynamics in simplified geometries representative of middle cerebral aneurysms. Three geometries are considered consisting of different bifurcations with an aneurysm located at the end of the parent vessel in which the neck of the aneurysm and the shape of the daughter branches are varied, but all vessel walls are flat to allow easy optical assess in the experiments. For the computations, two different viscoelastic models, namely the Giesekus and sPTT models were used based on fitting the rheology of real human blood to these models [5]. The numerical results were compared with velocity profiles obtained experimentally by means of micro-Particle Image Velocimetry measurements carried out in the different aneurysm configurations using blood analogue solutions recently developed by the group [5].

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