

MODELLING OF CHRONIC CEREBRO SPINAL VENOUS INSUFFICIENCY (CCSVI).

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ABSTRACT. Recently, Zamboni (2009) and collaborators have empirically discovered that a significant number of Multiple Sclerosis (MS) patients suffer from malformations in the veins that drain blood from the brain and the spinal cord. Such condition has become known as Chronic Cerebro Spinal Venous Insufficiency, or CCSVI for short. Zamboni and collaborators go further, see Singh and Zamboni (2009). They have put forward the hypothesis that anomalous venous haemodynamics could ultimately be the triggering mechanism of axon demyelination and MS.

In this presentation we describe our current work that aims at the construction of a closed-loop mathematical model of the human circulatory system to study the haemodynamical implications observed by Zamboni. Based on MRI data we have been able to construct a complex vascular network treated in multi-scale fashion as a combination of 0D (ODEs) and 1D hyperbolic systems. Here we address some of the mathematical and numerical challenges posed by the problem of interest. See Mueller et al. (2012). Preliminary results will be shown.

Keywords: Venous flow, multiple sclerosis, hyperbolic systems, numerical methods

Mathematics Subject Classifications (2000): 35B40, 35K57, 35Q92, 65M08, 92C50.

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