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Blood flow analysis in presence of static magnetic field of 3.0 T

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Interactions with a high intensity static magnetic field (0.2 T to 3.0 T) are widespread practice in a Magnetic Resonance Imaging study, hence, it is important to know the side effects associated with such exposures. In this work, a mathematical model and its numerical treatment is presented for a physical system that describes an artery segment through which oxygenated blood flows while being exposed to a 3.0 T magnetic field. The model uses the thermodynamics theory to propose an isothermal system and the generated energy of the magnetic field. An expression for the new pressure is derived to be coupled with the Navier-Stokes equations. Given the geometry and symmetry of the physical system under analysis, as a first approximation, a rectangular cavity is used for the numerical solution of the governing equations using the finite difference method. The code of the numerical method for the rectangular cavity was validated before being coupled to the raised problem. Results suggest that given the changes established by the presence of the magnetic field in the thermodynamic system, there are modifications in the speed profile as also in the blood flow.

Biography

J Alfredo Soto Á is a Physicist who has acquired experience in Medical Physics and its union with Computational Fluid Dynamics. He has also been in contact with MRI machines, originating interest in the interaction of magnetic fields with biofluids. Until now, he has worked only with the numerical technique of finite differences but he has a great interest in extending his research to element and finite volume.

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