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# METHODOLOGY FOR MODELING BLOOD FLOW IN THE MIDDLE CEREBRAL ARTERY USING POROSITY FUNCTIONS

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Strokes are still one of the most common causes of death worldwide. Understanding the mechanisms of their cause, especially those related to the presence of aneurysms, will allow innovative therapies to be developed. As the vascular system in the brain is extremely complex, with very small perforators branching directly from large-diameter arteries, numerical analyses are a good source of knowledge of the phenomena that affect blood flow in this area. To be reliable, however, it is necessary to correctly represent the boundary conditions, which is very complex for a complex vascular network. This paper proposes a new method that is relatively simple to implement.

For this purpose, a porosity function was utilized at the individual outlets of perforators to achieve velocities below 0.1 m/s in the perforator branches. Porosity parameters were iteratively selected for three groups of perforator diameters. This model will subsequently be used to evaluate the impact of the presence of a flow diverter device on the flow characteristics within the vascular tree. Parameters such as velocity profiles, the distribution of time-averaged wall shear stress (TAWSS), wall shear stress gradient (WSSG), and wall shear stress divergence (WSSD) were analyzed in this study. The analyses were conducted using computational fluid dynamics with the Ansys Fluent software. The areas where high wall shear stress, WSSD values occur will then be compared with histopathological study results, which will allow for a better understanding of the mechanisms occurring in cerebral vessels with multiple outlets.

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