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Modelling Ischemic Stroke and Temperature Intervention Using Vascular Porous Method STEPHEN BLOWERS, PRASHANT VALLURI , Institute of Materials and Processes, University of Edinburgh, IAN MARSHALL , Neuroimaging Sciences, Centre for Clinical Brain Sciences, University of Edinburgh, PETER ANDREWS , BRIDGET HARRIS , Critical Care Unit, NHS Lothian, Centre for Clinical Brain Sciences, University of Edinburgh, MICHAEL THRIPPLETON , Neuroimaging Sciences, Centre for Clinical Brain Sciences, University of Edinburgh — In the event of cerebral infarction, a region of tissue is supplied with insufficient blood flow to support normal metabolism. This can lead to an ischemic reaction which incurs cell death. Through a reduction of temperature, the metabolic demand can be reduced, which then offsets the onset of necrosis. This allows extra time for the patient to receive medical attention and could help prevent permanent brain damage from occurring. Here, we present a vascular-porous (VaPor) blood flow model that can simulate such an event. Cerebral blood flow is simulated using a combination of 1-Dimensional vessels embedded in 3-Dimensional porous media. This allows for simple manipulation of the structure and determining the effect of an obstructed vessel. Results show regional temperature increase of 1-1.5°C comparable with results from literature (in contrast to previous simpler models). Additionally, the application of scalp cooling in such an event dramatically reduces the temperature in the affected region to near hypothermic temperatures, which points to a potential rapid form of first intervention.

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