

Simulation of Decompressive Craniectomy for Ischaemic Stroke Treatment : A Conceptual Modelling Study

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Abstract:

Decompressive craniectomy is a treatment in which part of the skull is removed so as to reduce the intracranial pressure in the skull, especially during brain tissue swelling. Computational modelling studies may be used to understand the efficiency of this treatment in ischaemic stroke for advance clinical decision making. Thus, we performed a simulation using a mathematical model based on poroelastic theory and capillary filtration to see the effects of craniectomy in treating brain tissue swelling using 3D brain geometry. The results show that performing craniectomy can reduce intracranial pressure and reduce the effect of herniation. However, part of the brain is bulging out from the surgical hole and exert a small amount of stress on the tissue by the surgical edge. This mathematical modelling framework can be used for further investigation of finding the suitable parameters for a decompressive craniectomy

Keywords: Decompressive craniectomy; Brain swelling; Poroelastic model; Ischaemic stroke; capillary filtration.

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