INVESTIGATION OF THE CAPILLARY EFFECTS TOWARD BRAIN TISSUE POROELASTIC PROPERTIES USING ASYMPTOTIC EXPANSION HOMOGENIZATION

Abbas Shabudin [1] , Mohd Jamil Mohamed Mokhtarudin 1, Stephen Payne 2, and Nik Abdullah Nik Mohamed 1

1 Faculty of Mechanical Engineering, Universiti Malaysia Pahang, Pekan, Pahang,
abbasshabudin@gmail.com , mohdjamil@ump.edu.my , nikabdullah@ump.edu.my

2 Institute of Biomedical Engineering, University of Oxford, Oxford, UK
stephen.payne@keble.ox.ac.uk

Abstract:
Existing brain model to study brain oedema formation has an assumption of homogeneous brain capillary distribution, despite it is actually normally distributed. In this paper, the assumption is improved by applying asymptotic expansion homogenization (AEH) to a vascularized poroelastic model to obtain a new homogenized macroscale governing equations with 4 microscale cell problems. The cell problems are solved on a cube of brain tissue with capillary to obtain 4 tensors describing the mechanical and fluid transport properties of the brain. From the simulations, only the blood permeability and Biot's parameter tensors are significantly affected by the capillary tortuosities.

Keywords: Asymptotic Expansion Homogenization; Poroelastic Theory; Brain Tissue; Ischaemic Stroke; Cell Problems

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