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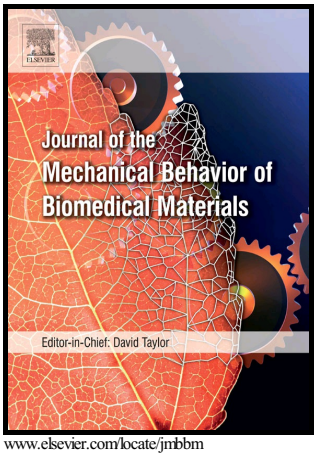

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Biomechanical characterization of human dura mater

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Abstract

A reliable computational model of the human head is necessary for better understanding of the physical mechanisms of traumatic brain injury (TBI), car-crash investigation, development of protective head gear ~~, the study of meningiomas, intracranial hematomas~~ and advancement of dural replacement materials. The performance and biofidelity of these models depend largely on the material description of the different structures present in the head. One of these structures is the dura mater, the protective layer around the brain.

We tested five human dura ~~maters~~ specimens, with samples at different locations, using planar biaxial tests. We describe the resulting stress-strain curves using both the anisotropic Gasser-Ogden-Holzapfel (GOH) model and the isotropic one-term Ogden model. The low-strain section of the curves is also described using a Neo-Hookean formulation.

~~From the stress-strain curves, the mechanical behaviour of the dura mater can be described as highly nonlinear and isotropic. No inter-specimen variability or location-dependency was identified. In conclusion, the GOH model captures the highly nonlinear behaviour better compared to the Ogden model. Finally, this paper provides reliable parameters for these models to be used in future finite element simulations.~~

The obtained stress-strain curves reveal highly nonlinear but isotropic behaviour. A significant amount of inter- and intra-specimen variability is noticed, whereby the latter does not seem to be influenced by location. The GOH model