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# NUMERICAL ANALYSIS OF CHITOSAN GUIDE TUBES USING MESHLESS METHODS AND NEW PHENOMENOLOGICAL LAWS

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**Summary:** Injuries in the peripheral nervous system affect 3% of trauma patients worldwide and they are a major cause of morbidity and life-long disabilities. There are different strategies that can be implemented in order to repair a nerve gap. One of them includes the use of a guide tube that is sutured to the nerve stumps, creating in its lumen optimal conditions for the regeneration process of the peripheral nerve. As a biomaterial, chitosan is a preferable candidate for the fabrication of these guide tubes, since it has many of the required characteristics.
In order to allow the simulation of the non-linear elasto-plastic behavior of chitosan, a constitutive model was developed, where both the yield criterion and the corresponding yield surface were defined. For this, relevant mechanical properties of chitosan were obtained from the literature, such as the Young's modulus, the yield stress and the strain for both compression and tension tests.
The constitutive model was combined with discrete numerical methods, such as the finite element method (FEM) and the radial point interpolation method (RPIM), which is a meshless method. Several simple 3D models of chitosan tubes were constructed and simulated using the proposed methodology. In the end, the nonlinear relation between stress and strain fields was obtained, allowing to understand the nonlinear structural response of the guide tubes when subjected to external loads.
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