The Structural Analysis of Chitosan Tubes Using Meshless Methods

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ABSTRACT

Chitosan is a natural and hydrophilic copolymer obtained from chitin and widely studied in biomechanics [1]. Chitosan is very versatile because of its inherent properties such as biodegradability, biocompatibility, non-antigenicity, non-toxicity and promotion of cell adhesion. One of the most interesting applications of chitosan is in the peripheral nerve regeneration field[2][3]. In this particular biomechanical application, hollow tubes of chitosan can bound two separate stumps of peripheral nerve, creating a microenvironment with optimal conditions for the regeneration of the peripheral nerve. In this work, several geometric models of chitosan tubes were constructed and numerically simulated using advanced discretization techniques. The discrete models had variable geometrical parameters such as length and internal and external radius. The numerical methods used were the finite element method (FEM), the radial point interpolation method (RPIM) and the natural neighbour RPIM (NNRPIM). [4] For each geometric model, displacement fields and stress-strain curves were obtained. Results show the structural response of these structures and allow to gauge the main differences between their shape and inner topology.

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