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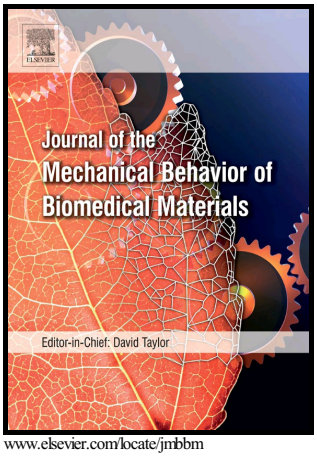

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Abstract

In this paper, to characterize the mechanical properties of meniscus by considering its local microstructure, a novel nonlinear poroviscoelastic Finite Element (FE) model has been developed. To obtain the mechanical response of meniscus, indentation experiments were performed on bovine meniscus samples. The ramp-relaxation test scenario with different depths and preloads was designed to capture the mechanical characteristics of the tissue in different regions of the medial and lateral menisci. Thereafter, a FE simulation was performed considering experimental conditions. Constitutive parameters were optimized by solving a FE-based inverse problem using the heuristic Simulated Annealing (SA) optimization algorithm. These parameters were ranged according to previously reported data to improve the optimization procedure. Based on the results, the mechanical properties of meniscus were highly influenced by both superficial and main layers. At low indentation depths, a high percentage relaxation