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Micromechanical modeling of Rate-dependent behavior of Connective tissues

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Abstract

In this paper, a constitutive and micromechanical model for prediction of rate-dependent behavior of connective tissues (CTs) is presented. Connective tissues are considered as nonlinear viscoelastic material. The rate-dependent behavior of CTs is incorporated into model using the well-known quasi-linear viscoelasticity (QLV) theory. A planar wavy representative volume element (RVE) is considered based on the tissue microstructure histological evidences. The presented model parameters are identified based on the available experiments in the literature. The presented constitutive model introduced to ABAQUS by means of UMAT subroutine. Results show that, monotonic uniaxial test predictions of the presented model at different strain rates for rat tail tendon (RTT) and human patellar tendon (HPT) are in good agreement with