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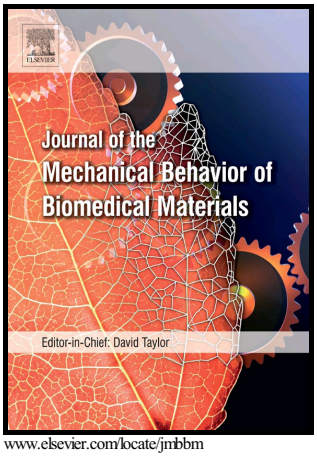

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New methodology for mechanical characterization of human superficial facial tissue anisotropic behaviour in vivo

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Abstract

Mechanical characterization of human superficial facial tissue has important applications in biomedical science, computer assisted forensics, graphics, and consumer goods development. Specifically, the latter may include facial hair removal devices. Predictive accuracy of numerical models and their ability to elucidate biomechanically relevant questions depends on the acquisition of experimental data and mechanical tissue behavior representation. Anisotropic viscoelastic behavioral characterization of human facial tissue, deformed *in vivo* with finite strain, however, is sparse.

Employing an experimental-numerical approach, a procedure is presented to evaluate multidirectional tensile properties of superficial tissue layers of the face *in vivo.* Specifically, in addition to stress relaxation, displacement-controlled multi-step ramp-and-hold protocols were performed to separate elastic from inelastic properties. For numerical representation, an anisotropic hyperelastic material model in conjunction with a time domain linear viscoelasticity formulation with Prony series was employed. Model parameters were inversely derived, employing finite element models, using multi-criteria optimization.

The methodology provides insight into mechanical superficial facial tissue properties.