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AN ARTERIAL CONSTITUTIVE MODEL ACCOUNTING FOR COLLAGEN CROSS-LINKING

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Experimental data indicate that the density of cross-links in collagenous tissue has a stiffening effect on the mechanical response of the tissue. The talk represents a first attempt to characterize this effect on the elastic response, particularly with regard to arterial tissue. A simple phenomenological continuum model with a cross-link dependent stiffness is considered and the influence of the cross-link density on the response in uniaxial tension is illustrated [1]. In addition, a recently developed extension of the model is outlined that considers dispersed fibers connected by randomly distributed cross-links. The model is essentially based on two mechanisms: (i) a fiber dispersion-induced cross-link dispersion and (ii) a fiber-independent cross-link dispersion connecting any two parallel fibers of the sample space [2]. Based on this, a simple shear test with a focus on the sign of the normal stress perpendicular to the shear planes (Poynting effect) is analyzed. As shown, the cross-links have a significant influence on the considered normal stress.

REFERENCES

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