Constitutive modeling of passive myocardium

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Introduction: In recent years, experimental tests and equations in continuum mechanics are frequently used to obtain the constitutive models for soft biological tissues. Biaxial tensile test experiment is one of the prevalent approaches for the data acquisition. As the myocardium is considered one of the most important tissues in human body that plays a critical role in heart's proper functioning, we studied and investigated the mechanical response of passive myocardium undergoing biaxial tensile stretch test.

Materials and Methods: The morphology and structure of myocardium in literature was reviewed as the first step. The myocardium of left ventricle was considered as an incompressible, non-homogeneous, and nonlinear elastic material [1-3]. A test protocol defined for sacrificing the animals, obtaining the fibers orientation, and performing the experiments on three lambs' myocardium. During the experiments the stress strain data were recorded and saved on a flash drive for further data analysis.

Results and Conclusions: The data processed in Matlab Mathworks R2013a and constitutive models of passive myocardium has been constructed and evaluated. The material constants values have been obtained from curve fitting performed in Matlab cftool. In the final model the strain-energy function as Cauchy's invariants are obtained which can be pave the way for heart function simulations.

References:

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