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动脉壁的动力响应特性

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Dynamical Analysis of Arterial Wall

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- 摘要
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摘要 基于纤维加强各向异性不可压超弹性复合材料两层厚壁圆筒模型，应用连续介质力学有限变形理论和非线性动力学理论，建立脉动压作用下动脉壁的动力学模型，考虑动脉壁中残余应力、平滑肌主动作用以及纤维分散的影响，通过数值计算得到动脉壁的时程曲线、频谱图、相图和庞加莱截面图及应力分布曲线，利用非线性动力学理论分析了动脉壁的动力学响应特性，讨论了脉动压大小和频率的影响.

关键词： 连续介质力学 平滑肌 残余应力 纤维分散 非线性动力学

Abstract： A dynamical differential model for the arterial wall under pulse pressure is established based on a fiber-reinforced two-layer composite heterogeneous hyper-elastic tube within the finite deformation theories of continuum mechanics. Effects of the residual stress, smooth muscle activity and fiber dispersion are discussed. Time-history curves, frequency spectra, phase diagrams, Poincare maps and stress distribution curves are obtained through numerical computation. Dynamical response of the arterial wall taking into account the effects of the value and frequency of the pressure are discussed based on the nonlinear dynamical theory.

Keywords： continuum mechanics, smooth muscle, residual stress, fiber dispersion, nonlinear dynamical theory

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