A Constrained Mixture Theory for Arterial Adaptation and Disease Presentation

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Arteries exhibit a remarkable ability to grow and remodel in response to sustained alterations in hemodynamic loads, to compensate biomechanically in response to certain genetic mutations, and to adapt, in part, during certain types of disease progression. The goal of this talk is to present a single theoretical framework for capturing salient aspects of both arterial adaptations and maladaptations. As illustrative examples, we will consider central artery adaptations to sustained increases in blood flow and pressure as well as the enlargement of aortic aneurysms. As it will be seen, this theoretical framework provides a convenient approach to generate and test mechanobiological hypotheses, which in turn can guide experimental design and, it is hoped, ultimately clinical decisions.