



Tissue Mechanics

Susan S. Margulies

University of Pennsylvania, Philadelphia, USA

The tissue mechanical properties are central to understanding macroscopic and microscopic effects of disease, aging, and altered loading conditions. More recently, the macroscopic mechanical milieu has been shown to affect cellular responses. Furthermore, tissue properties are used in computational models to estimate local and global stresses and strains and predict tissue injury, perfusion, functional responses. As such, determination of accurate tissue mechanical properties is fundamental to the fields of orthopaedics, cardiovascular and pulmonary mechanics, injury mechanics, rehabilitation engineering, and tissue and cellular engineering. Using a broad range of tissues, techniques for in vivo and in vitro measurement of tissue mechanics will be presented, as well as issues related to study design, specimen handling, and validation. Experimental and analytical approaches for nonlinear, anisotropic, and viscoelastic materials will be covered. Influences of developmental age, species, and disease will be introduced with the goal of presenting a format for determining relevant tissue mechanics.