

## Design of a Micro-Biaxial Testing Device for Soft Tissues

Chad E. Eckert, Michael S. Sacks

Heart valves are essential components of the circulatory system serving as “check valves” to prevent retrograde blood flow. They are complex, tri-layered structures that are highly adapted to their environments. Disease, calcification, or congenital defects can lead to a reduction or failure in performance. Efforts have been made to understand the mechanics of heart valves, though the minimum sample size (roughly 10 mm per side) is restricted by current testing device limitations. As a result, the mechanical properties of local tissue structures and individual valve layers have not been fully investigated. We have designed a device that is capable of biaxially testing valve tissue on a 1-3 mm per side range in response to these issues. A unique piezoelectric actuation/transduction system is proposed to induce and measure loads on the order of  $10^{-4}$  N with displacements of 220 $\mu$ m per side. A novel tissue manipulation device has also been designed to facilitate the movement and preparation of samples. Likewise, a method to grip the samples based on previous components has been proposed. Preliminary test results should be available shortly.

