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Response of microscale cell/matrix constructs to successive force application in a 3D environment ALAN LIU, Johns Hopkins University, CHRISTOPHER CHEN, Boston University, DANIEL REICH, Johns Hopkins University — Mechanical dilation of arteries by pulsatile blood flow is directly opposed by coordinated contraction of a band of smooth muscle tissue that envelops the vessels. This mechanical adaptation of smooth muscle cells to external loading is a critical feature of normal blood vessel function. While most previous studies on biomechanical systems have focused on single cells or large excised tissue, we utilize a device to apply forces to engineered smooth muscle microtissues. This device consists of arrayed pairs of elastomeric micro-cantilevers capable of magnetic actuation. Tissues are formed through self-assembly following the introduction of cell-infused collagen gel to the array. With this system, we are able to dynamically stretch and relax these sub-millimeter sized tissues. The timing and magnitude of the force application can be precisely controlled and thus can be used to mimic a wide range of physiological behavior. In particular, we will discuss results that show that the interval between successive force applications mediates the both the subsequent mechanical and active dynamics of the cell/matrix composite system. Understanding this process will lead to better understanding of the interplay between cell and extracellular matrix responses to mechanical stimulus at a novel length scale.

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