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Use of magnetic micro-cantilevers to study the dynamics of 3D engineered smooth muscle constructs[1] ALAN LIU, RUOGANG ZHAO, CRAIG COPELAND, Johns Hopkins University, CHRISTOPHER CHEN, University of Pennsylvania, DANIEL REICH, Johns Hopkins University — The normal and pathological response of arterial tissue to mechanical stimulus sheds important light on such conditions as atherosclerosis and hypertension. While most previous methods of determining the biomechanical properties of arteries have relied on excised tissue, we have devised a system that enables the growth and in situ application of forces to arrays of stable suspended microtissues consisting of arterial smooth muscle cells (SMCs). Briefly, this magnetic microtissue tester system consists of arrays of pairs of elastomeric magnetically actuated micro-cantilevers between which SMC-infused 3D collagen gels self-assemble and remodel into aligned microtissue constructs. These devices allow us to simultaneously apply force and track stress-strain relationships of multiple microtissues per substrate. We have studied the dilatory capacity and subsequent response of the tissues and find that the resulting stress-strain curves show viscoelastic behavior as well as a linear dynamic recovery. These results provide a foundation for elucidating the mechanical behavior of this novel model system as well as further experiments that simulate pathological conditions.

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