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Pericyte Actomyosin-Mediated Contraction at the Cell-Material Interface can Modulate the Microvascular Niche ADAM ZEIGER, MIT, MACIEJ KOTECKI, Tufts University, JOHN MALONEY, MIT, IRA HERMAN, Tufts University, KRYSTYN VAN VLIET, MIT — Here we employ the experimental finding that pericytes can wrinkle a freestanding, underlying membrane via actin-mediated contraction. Pericytes were cultured on deformable silicone substrata. Local stiffness of subcellular domains was investigated by using AFM-enabled nanoindentation. Substratum contraction was quantified by normalized change in wrinkle contour lengths, and a model was used to relate local strain energies to pericyte contractile forces. The nature of pericyte-generated wrinkling and contractile protein-generated force transduction was further explored by the addition of pharmacological cytoskeletal inhibitors that affected contractile forces and the effective elastic moduli of pericyte domains. Actin-mediated forces are sufficient for pericytes to exert an average contraction of 38% on the substrata employed in these in vitro studies. Pericyte generated contractile forces thus serve as a direct mechanical stimulus to adjacent vascular endothelial cells, potentially altering the effective mechanical stiffness of nonlinear-elastic extracellular matrices, to modulate pericyte-endothelial cell interactions that directly influences physiologic angiogenesis.

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