Micromechanical Properties of Endothelial Cell Cytoskeleton
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Atherosclerotic plaques occur in regions of arterial curvature, where there is blood re-circulation and physiologically low shear stress conditions. This phenotype may be related to flow-induced shear stress on the monolayer of endothelial cells that make up the endothelium. When endothelial cells in static culture are exposed to laminar flow, they respond by rearranging their cytoskeleton, and aligning their actin filaments in the direction of flow. The changes in cytoskeletal structures induced by flow are different from region to region of the same cell. We employ the optical tweezers technique to obtain very local mechanical properties of endothelial cell cytoskeleton. We used endocytosed polystyrene beads, as well as intrinsic granular structures, as probes for our measurements. Endothelial cells were also treated with Cytochalasin B and Nocodazole, which are drugs that de-polymerize actin filaments and microtubules respectively, to measure the visco-elastic moduli, and obtain the contribution of each cytoskeletal structure in the cells’ micro-mechanical properties.