Mechanical Characterization of Vascular Endothelial Cells Focusing on Intracellular Structures

Vascular endothelial cells in vivo are exposed to complex mechanical forces including fluid shear stress, cyclic stretch and hydrostatic pressure. These mechanical forces are important factors in endothelial cell remodeling, possibly altering endothelial cell physiological functions. After applying fluid shear stress, cultured endothelial cells show marked elongation and orientation in the direction of flow. In addition, thick stress fibers of actin filaments develop and align along the cell long axis. It is believed that cell deformations and associated mechanotransduction responses to mechanical forces are critical for cell-involved tissue homeostasis in health and disease. So far, a lot of efforts have been done to study the effects of mechanical stimuli on the cell remodeling focusing on morphological and cytoskeletal changes or intracellular signaling events. However, little is still known of how mechanical forces are transmitted through cells to activate intracellular signalling cascades leading to alterations in cell functions. To further address this issue, it would be required to know intracellular mechanical environment including mechanical properties of subcellular structural components such as actin filaments, nucleus and so forth. The objective of this talk is to present recent findings related to cell biomechanics, introducing measurement methods including fluorescence imaging and mechanical tests of intracellular (Fig. 1).

Fig. 1 Experimental approaches towards organelles understanding of cell mechanics.