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Using Optical Tweezers to Study Cell Mechanics during Airway Reopening[1] HUSEYIN YALCIN, Mechanical Eng., Lehigh University, JING WANG, Physics Dept., Lehigh University, SAMIR GHADIALI, Mechanical Eng., Lehigh University, H. DANIEL OU-YANG, Physics Dept., Lehigh University — Patients suffering from the acute respiratory distress syndrome (ARDS) must be mechanically ventilated in order to survive. However, these ventilation protocols may generate injurious hydrodynamic stresses especially during low tidal volume (VT) ventilation when the flow of micron-sized air bubbles displace the surrounding liquid. In-vitro studies in our lab revealed that microbubble flows can severally damage lung epithelial cells (EC). The degree of injury was elevated for sub-confluent monolayers in small channel heights. Under these conditions, the micromechanics of individual EC may influence the degree of cellular injury. To investigate the role of cell mechanics, we used an oscillating Optical Tweezers (OT) technique to measure the intrinsic mechanical properties of EC before and after the flow of microbubbles. Knowledge of how the EC's micromechanical properties influence cell viability may lead to the development of novel treatment therapies that enhance the EC's ability to withstand injurious hydrodynamic stresses during ventilation treatment.

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