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Mechanical phenotyping of tumor cells using a microfluidic cell squeezer device ZEINA S. KHAN, NABIOLLAH KAMYABI, SIVA A. VANAPALLI, Texas Tech University, Chemical Engineering Department — Studies have indicated that cancer cells have distinct mechanical properties compared to healthy cells. We are investigating the potential of cell mechanics as a biophysical marker for diagnostics and prognosis of cancer. To establish the significance of mechanical properties for cancer diagnostics, a high throughput method is desired. Although techniques such as atomic force microscopy are very precise, they are limited in throughput for cellular mechanical property measurements. To develop a device for high throughput mechanical characterization of tumor cells, we have fabricated a microfludic cell squeezer device that contains narrow micrometer-scale pores. Fluid flow is used to drive cells into these pores mimicking the flow-induced passage of circulating tumor cells through microvasculature. By integrating high speed imaging, the device allows for the simultaneous characterization of five different parameters including the blockage pressure, cell velocity, cell size, elongation and the entry time into squeezer. We have tested a variety of in vitro cell lines, including brain and prostate cancer cell lines, and have found that the entry time is the most sensitive measurement capable of differentiating between cell lines with differing invasiveness.

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