Supplementary Information (SI) for Lab on a Chip.

Supplementary Information for

Real-time high-throughput characterisation of the surface elasticity of suspended cells

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(a)

Row \ Column	1	2	3
1	$\beta = 0.83, Ca = 0.45,$ $G_s = 5.3\ , K_s = 111.1\ mN/m$	$\beta = 0.82, Ca = 0.25,$ $G_s = 9.5\ , K_s = 199.9\ mN/m$	$\beta = 0.81, Ca = 0.15,$ $G_s = 15.9\ , K_s = 333.2\ mN/m$
2	$\beta = 0.72, Ca = 0.55,$ $G_s = 4.3\ , K_s = 90.9\ mN/m$	$\beta = 0.77, Ca = 0.30,$ $G_s = 7.9\ , K_s = 166.6\ mN/m$	$\beta = 0.73, Ca = 0.1,$ $G_s = 23.8\ , K_s = 499.8\ mN/m$
3	$\beta = 0.65, Ca = 0.45,$ $G_s = 5.3\ , K_s = 111.1\ mN/m$	$\beta = 0.64, Ca = 0.2,$ $G_s = 11.9\ , K_s = 249.9\ mN/m$	$\beta = 0.62, Ca = 0.1,$ $G_s = 23.8\ , K_s = 499.8\ mN/m$
4	$\beta = 0.55, Ca = 0.55,$ $G_s = 4.3\ , K_s = 90.9\ mN/m$	$\beta = 0.53, Ca = 0.30,$ $G_s = 7.9\ , K_s = 166.6\ mN/m$	$\beta = 0.5, Ca = 0.05,$ $G_s = 47.6\ , K_s = 999.6\ mN/m$
5	$\beta = 0.47, Ca = 0.65,$ $G_s = 3.7\ , K_s = 76.9\ mN/m$	$\beta = 0.44, Ca = 0.30,$ $G_s = 7.9\ , K_s = 166.6\ mN/m$	$\beta = 0.45, Ca = 0.05,$ $G_s = 47.6\ , K_s = 999.6\ mN/m$

(b)

Row \ Column	1	2	3
1	$\beta = 0.81, Ca = 0.50,$ $G_s = 2.0\ , K_s = 41.2\ mN/m$	$\beta = 0.85, Ca = 0.30,$ $G_s = 3.3\ , K_s = 68.6\ mN/m$	$\beta = 0.81, Ca = 0.10,$ $G_s = 9.8\ , K_s = 205.8\ mN/m$
2	$\beta = 0.7, Ca = 0.65,$ $G_s = 1.5\ , K_s = 31.7\ mN/m$	$\beta = 0.75, Ca = 0.40,$ $G_s = 2.5\ , K_s = 51.5\ mN/m$	$\beta = 0.76, Ca = 0.10,$ $G_s = 9.8\ , K_s = 205.8\ mN/m$
3	$\beta = 0.64, Ca = 0.45,$ $G_s = 2.2\ , K_s = 45.7\ mN/m$	$\beta = 0.66, Ca = 0.25,$ $G_s = 3.9\ , K_s = 82.3\ mN/m$	$\beta = 0.64, Ca = 0.05,$ $G_s = 19.6\ , K_s = 411.6\ mN/m$
4	$\beta = 0.55, Ca = 0.55,$ $G_s = 1.8\ , K_s = 37.4\ mN/m$	$\beta = 0.56, Ca = 0.40,$ $G_s = 2.5\ , K_s = 51.5\ mN/m$	$\beta = 0.50, Ca = 0.10,$ $G_s = 9.8\ , K_s = 205.8\ mN/m$
5	$\beta = 0.48, Ca = 0.55,$ $G_s = 1.8\ , K_s = 37.4\ mN/m$	$\beta = 0.42, Ca = 0.20,$ $G_s = 4.9\ , K_s = 102.9\ mN/m$	$\beta = 0.45, Ca = 0.05,$ $G_s = 19.6\ , K_s = 411.6\ mN/m$

Table S1 Best-fit parameters in numerical simulations for the (a) K-562 cells in Fig. 2a and (b) PC-3 cells in Fig. 2b.

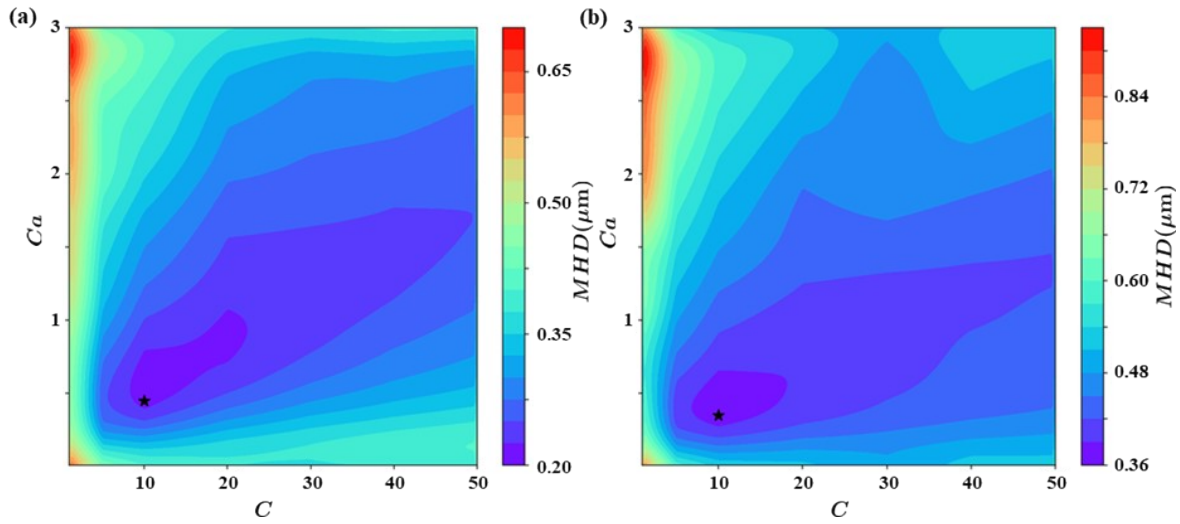

Figure S1 Contour plots of the mean Hausdorff distance (MHD) between steady-deformed cell profiles obtained from numerical simulations and experiments for the (a) K-562 cell of Fig. 2c and (b) PC-3 cell of Fig. 2d. The two stars mark the locations of the minimum MHD, indicating the best fits.

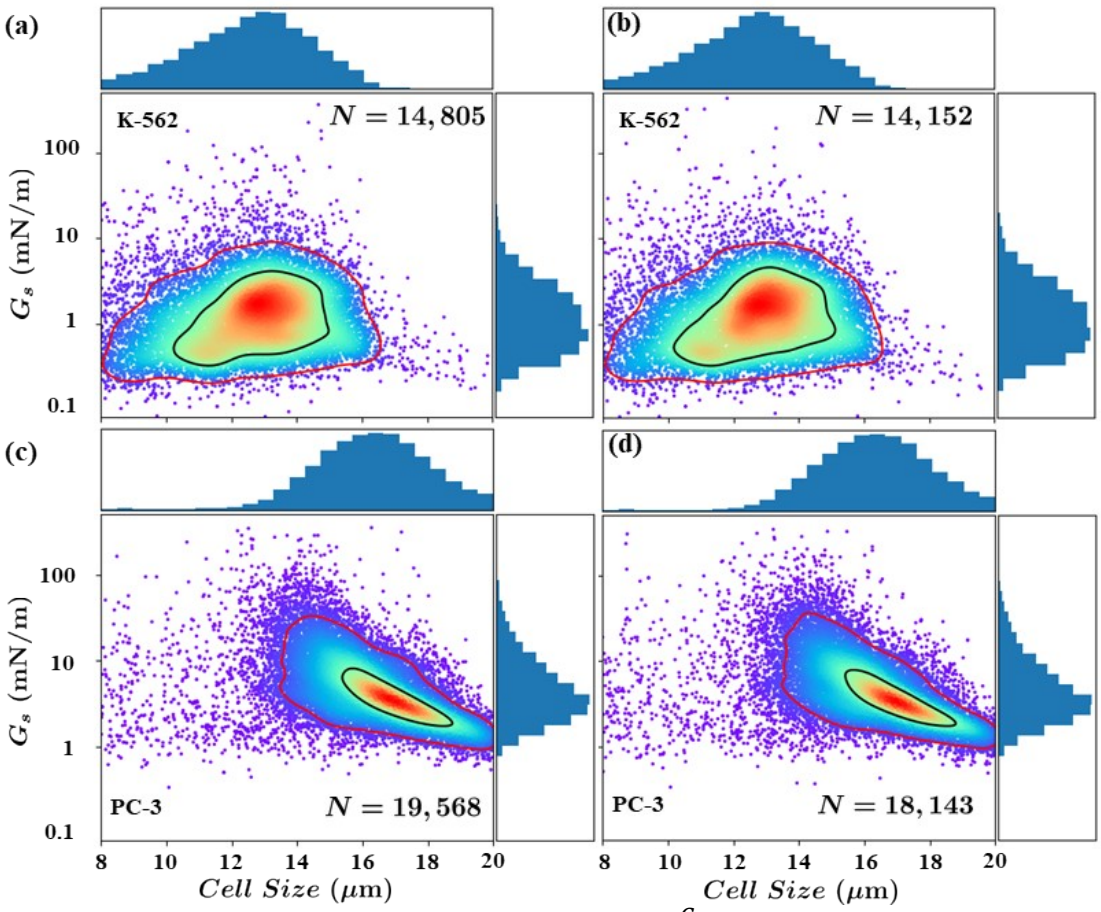

Figure S2 Scatter plots of the surface shear elasticity ^{G_s} versus cell size of the (a, b) K-562 cells of Fig. 5a and (c, d) PC-3 cells of Fig. 5b. (a) & (c) are properties of cells measured in the first 2 minutes, and (c) & (d) are measured in the final 2 minutes of the experiments. The results show little time-dependent variations during the ~10-minute experiments.

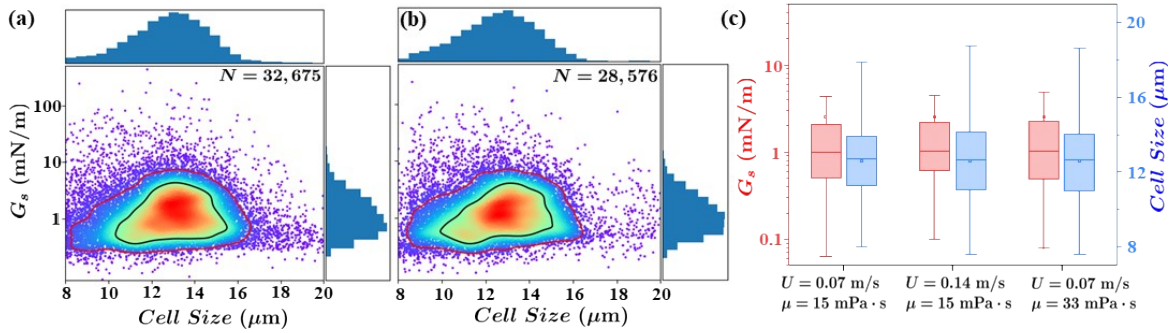

Figure S3 Effects of the flow speed and suspension fluid viscosity on the inferred surface G_s of K-562 cells. Scatter plots of G_s versus size of (a) 32,765 K-562 cells suspended in PBS added with 2% methylcellulose flowing at a speed of 0.14 m/s, and (b) 28,576 K-562 cells suspended in PBS added with 3% methylcellulose flowing at 0.07 m/s. The result of the baseline experiment using the same batch of K-562 cells has been shown in Fig. 5a. (c) Box plots of the surface G_s and size of K-562 cells measured at the three different flow conditions.

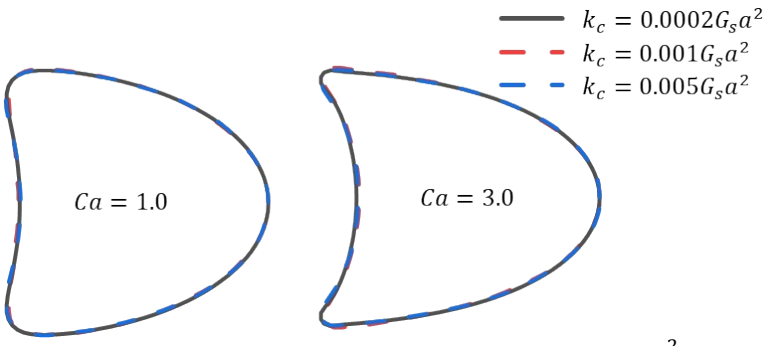

Figure S4 Surface bending stiffness of the order of $k_c \sim 0.001G_s\, a^2$ has little effect on the steady deformation profile of a cell in a microchannel. The confinement ratio is $\beta = 0.6$. This observation is consistent with the results of Dupont et al. (C. Dupont, et al., *Phys. Fluids*, 2015, 27, 051902) about the influence of membrane bending on flow-induced deformation of microcapsules.