Supplementary Figures



Figure S-1. Fluorescent micrographs of endothelial monolayer in test regions 1-8 (from right to left) after ~15 hours of perfusion in the microfluidic setup. The magnitudes of shear stress in dyn/cm² are shown in the upper right corners. Scale bar is 200 μ m. Actin filaments of endothelial cells were fluorescently labeled by staining with Alexa488-phalloidin, after the perfusion was stopped and the magnetic clump was disassembled. The staining protocol is described in detail in L. E. Goldfinger, E. Tzima, R. Stockton, W. B. Kiosses, K. Kinbara, E. Tkachenko, E. Gutierrez, A. Groisman, P. Nguyen, S. Chien and M. H. Ginsberg, *Circulation Research*, 2008, **103**, 177-185.



Figure S-2. Healing of a scratch wound in endothelium monolayer in the microfluidic device at a shear stress of 5 dyn/cm². (a) Micrograph of the original wound with superimposed tracks of migration of individual cells during the wound healing shown as blue and yellow curves. The flow direction is vertically down. Scale bar is 50 μ m. (b) Mean displacement along the direction of flow for cells migrating from the upstream edge (red curve) and from the downstream edge (blue curve) of the wound. Cells from the upstream and downstream edges migrated downstream and upstream, respectively. Linear fits to the curves give mean migration speeds of 18 and 11 μ m/hr, respectively. Cell tracking was performed with ImagePro 6.0 software (Media Cybernetics, Bethesda, MD) from a sequence of images taken every 10 min.