Cancer Progression Alters Morphological Fluctuation and Migration of Human Gastric Cells

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The structure of multicellular tissues becomes disordered according to the cancer progression, and single cells display a wider variety in size and shape (pleomorphism). Although this static, phenomenological information is utilized as an indicator of cancer staging in the field of pathology, little is known about the mechanism on how the collective ordering in tissues and the dynamics of single cells are correlated during the cancer progression. In this research, we describe human gastric cells at different cancer stages as self-propelled deformable particles [1], and aim to reveal the correlation between their adhesion, active deformation, and migratory motion.
To model the interactions between gastric cells and extracellular environments, we functionalized the surface of supported membranes [2] with laminin, which is the main component of basal lamina [3]. Active deformation of the adhesion zone of human gastric cells in four different cancer stages was recorded with a label-free, reflection interference contrast microscopy (RICM). We found that well differentiated "healthy" cancer cells hardly migrate nor deform, while poorly differentiated "sick" cancer cells actively deform and migrate. Our data unraveled that active shape fluctuation and migration are clearly correlated with cancer progression.

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