Tumors create and experience a variety of forces. Pockets of excessive cell growth lead to increased mechanical stresses on and deformation of the extracellular matrix (ECM), which is made up of fibroblasts, collagen, and other fibers. Greater numbers of infiltrating stromal and immune cells can similarly stretch the matrix, as can hydrogel components such as hyaluronan molecules, which absorb water and swell. The deformed matrix, in turn, may facilitate the metastatic escape of cancer cells and cause blood vessels within the tumor to collapse, inhibiting the delivery of nutrients, removal of waste, and entry of tumor-targeted drugs. Reduced blood flow can also result in hypoxia, which may lead to immunosuppression, inflammation, and metastasis, as well as lowered efficacy of chemo-, radio-, and immunotherapies. Compressive stresses may also induce cells to become more invasive, perhaps by inducing the expression of oncogenes.

In addition to these solid forces, fluid pressure exerted by the circulatory system can force interstitial fluid to flow from the tumor. Escape of plasma from blood vessels produces shear stresses that can affect cancer cells, blood vessels, myofibroblasts, and immune cells, as well as promote tumor progression by recruiting blood vessels into the tumor and guiding the migration of cancer cells out of the tumor.