

Image-based characterization of functional and structural heterogeneity of breast tumor vasculature using blood flow and oxygenation modeling

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Tumor-associated angiogenesis is an indispensable factor for the progression of solid tumors beyond a minimal size (1-2 mm³). The unprecedented advances in automated microscopic imaging allow the accurate 3D visualization of the morphology of individual vessels in tumors and the description of their function. We have combined high-resolution imaging with blood flow and oxygenation modeling to produce maps of blood flow and oxygen distribution across the vascular and extravascular areas of tumor xenografts. Such development can be crucial to address the complex dynamics of the distribution of hypoxic regions across the tumor, and provide insights for their correlation with tumor vasculature structural properties. The accurate representation of the microenvironment of solid tumors we are proposing provides a framework where hypotheses about drug delivery strategies can be tested in an efficient and inexpensive manner.