



Tumor galaxy

Sixian You

Bioengineering

Standard histopathology for diagnoses and prognoses of cancer has been limited by sample treatment-induced artifacts, long turnaround time, high cost and inadequate accuracy. We aim to overcome these limitations by using stain-free nonlinear optical histopathology, which can image endogenous molecules directly from untreated, unstained fresh tissue in real time. The presented image is a representative stain-free slide-free image from fresh human cancer tissue featuring tumor cells (purple) surrounded by reorganized collagen matrix (green) and adipocytes (blue). This "organic" visualization at molecular level (no tissue processing involved) is enabled by our custom-built nonlinear optical imaging system, which efficiently exciting various endogenous molecules via coherently controlled nonlinear optical processes. The long-term goal of this research project is to transform our approach and ability to detect and quantify early changes in breast cancer, and establish the clinical utility of using this new image-based information for diagnosis, prognosis, and medical decision making in the treatment of breast cancer.