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Fractal Analysis of Optical Coherence Tomography of Normal and Malignant Breast Tissue AMANDA C. SULLIVAN, JOHN P. HUNT, AMY L. OLDENBURG, University of North Carolina at Chapel Hill — Optical coherence tomography (OCT) provides real-time imaging of tissue several mean free photon paths into tissue by heterodyne detection of backscattered light. OCT can potentially be used to rapidly assess tumor margins during breast cancer resection, however, currently it is difficult to differentiate between normal and malignant tissues with OCT. Because cancer is characterized morphologically by increasing disorder, we investigated the fractal dimension of OCT images of normal and cancerous breast tissue. 3D OCT images of 44 specimens were collected, then tissues were histologically processed to independently determine distinct regions of adipose, stroma and cancer. The fractal dimension of each tissue type was then calculated with a one-dimensional box-counting algorithm applied to the OCT axial scans. We found that the fractal dimensions of stromal tissues were significantly higher than those of cancer ($P<10^{-6}$), while those of adipose tissue were significantly lower than those of cancer ($P<10^{-4}$).

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