

Optical signatures of cancer in the human breast

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Abstract:

Diffuse optics utilizes near-infrared light to probe tissue without ionizing radiation. These tools permit rapid and pain-free assessment of endogenous cancer signatures, including oxygenated and deoxygenated hemoglobin, lipid, and water concentrations. Relatively inexpensive instrumentation can monitor the progress of neoadjuvant chemotherapy in a clinic, rather than an imaging suite, using convenient hand-held probes, even in radiologically dense breasts. Very recently, similar optical monitoring tools have been developed to measure microvascular blood flow. More elaborate diffuse optical imaging systems construct three dimensional tomograms of multiple tissue constituents, permitting multi-parameter computer aided detection and localization of tumors. In addition to endogenous chromophores, these optical measurements are exquisitely sensitive to contrast agents, holding significant promise for imaging of highly specific contrast agents at pico- or femto-molar concentrations. Diffuse optical instrumentation can readily be combined with other imaging techniques. These multi-modality data sets provide the opportunity to combine the advantageous aspects of both techniques. We will discuss recent advances in optical monitoring, imaging, and combinations with other modalities.