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A novel handheld diffuse optical breast cancer imaging probe

Majid Shokoufi and Farid Golnaraghi
Simon Fraser University, Canada

Diffuse optical spectroscopy (DOS) and diffuse optical imaging (DOI) are relatively new methods for breast cancer diagnosis which are noninvasive and nonionizing techniques. In the present study, we have introduced a novel handheld diffuse optical breast scanning (DOB-Scan) probe to measure optical properties of breast tissue and create functional and compositional cross-sectional images of the breast. Four near-infrared wavelengths light emitting diodes (LED), encapsulated in a package (eLED), are used to illuminate the breast tissue. A linear charge coupled device (CCD) measures the intensity of the scattered photons at different radial destinations from the illumination source on the surface of the breast tissue. The proposed method replaces fiber optic based illumination techniques, which increases the complexity, size and cost of a potential probe, by multi-wavelengths eLED which acts as a pencil beam source in such a scattering media like the breast tissue. Although the introduced technique miniaturizes the probe, this study points to the reliability and accuracy of this technique in breast imaging. The average scattering coefficient of the medium and localized concentration variations in oxyhemoglobin and deoxyhemoglobin can be measured utilizing the probe. In order to evaluate the performance of DOB-scan probe, a series of tissue-like materials, containing of Intralipid®, Black ink, Delrin®, and PierceTM have been used. We have received ethical approvals to test the DOB-scan probe on patients who are known with breast cancer and we are currently testing the DOB-scan probe on real subjects.

mshokouf@sfu.ca