Opto-Acoustic Imaging

Opto-acoustic imaging technology combines optics and acoustics with a goal of improving the accuracy of the cancer diagnosis without the use of ionizing radiation (x-ray). The process starts by illuminating the breast with laser light of specific wavelengths. Tumors preferentially absorb the light over normal tissue and become slightly heated. A transient thermoelastic expansion causes a tumor to emit a pressure (acoustic) wave. This acoustic wave is then detected by an array of sensors positioned around the periphery of the breast held within the probe.

Signals from the sensors are analyzed and assembled into high contrast, high-resolution images that present the lesion in striking color. Because image contrast is related to both blood volume and oxygenation status, lesions may be correlated with benign or malignant histopathology. This is because malignant tumors possess increased microvasculature, but deplete oxygen from the blood at a higher rate than benign growths. Deoxygenated blood results in brighter images in the presence of a shorter wavelength than it does in the presence of a longer wavelength.

This technology has the merit of both the high contrast and spectral specificity of optical imaging and the sensitivity and resolution of ultrasonic imaging. It is more than just a combination of the two methods. The goal is to incorporate laser illumination and ultrasonic detection to achieve very high detection sensitivity.

Opto-acoustic imaging may permit the identification of tumors as small as 2 mm and has demonstrated the ability to see submillimeter structures. Early detection is important because biologically advanced tumors are more capable of metastasis.