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(54) Title: A SYSTEM AND A METHOD TO DISTINGUISH BETWEEN BENIGN AND MALIGNANT BREAST TUMORS

(57) Abstract: Herein disclosed is an ex vivo method of identifying a state of a tumor margin in a sample. The method comprises operating a system to generate an ultrasound image and a photoacoustic image, wherein the system comprises: a probe configured to deliver a pulsed laser from a laser source to a sample, wherein the laser source is operable to generate the pulsed laser; arrays coupled to the probe, wherein one of the arrays comprises transducing elements arranged thereon which are operable to transmit and collect ultrasound signals, and wherein one of the arrays comprises transducing elements arranged thereon which are operable to collect photoacoustic signals; and a data acquisition module which converts the ultrasound signals and the photoacoustic signals into the ultrasound image and the photoacoustic image, respectively, identifying from the photoacoustic image the presence or absence of lipids and observing for a pattern and distribution of the lipids, identifying from the photoacoustic image the presence or absence of collagen and observing for a pattern and distribution of the collagen; identifying from the photoacoustic image the presence or absence of hemoglobin and observing for a pattern and distribution of the hemoglobin; and comparing from the photoacoustic image an intensity of the collagen and/or hemoglobin, if present, with an intensity of tissue proximal to the collagen and/or hemoglobin. Herein disclosed is a method of determining a state of a tumor.

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