Abstracts

Thermographic Tumor Detection Enhancement Using Microwave Heating

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Infrared thermography offers a viable alternative to X-ray mammography for early breast cancer detecetion if the inherent Iow sensitivity of the technique can be improved. This paper presents results which indicate that the sensitivity of thermography is increased by irradiating the examined area with microwaves. This arises because of selective absorption characteristics of the particular tumor tissue investigated; specifically, it has been observed that in situ irradiation of transplantable guinea pig hepatoma, using 2450-GHz microwave radiation, results in a tumor temperature rise of 5.5°C and a rise of 2.5°C in the surrounding healthy tissue. This spatial gradient of 3°C compares with the relevant unheated spatial gradient of approximately 0.5°C. The microwave-induced increased temperature differential between tumor and healthy tissue is easily observed using a thermovision camera. Data regarding the temporal evolution of spatial temperature distributions associated with tumor tissue before, during, and after microwave irradiation are presented. Additional data are included regarding the heating and cooling rates of microwave-irradiated tumors. The data show conclusively that the specific tumor investigated selectively absorbs microwave energy in situ and exhibits this selective absorption as a thermographically observable increase in local skin surface temperature. The data further show that tumor heating and cooling rates are faster than for healthy tissue.

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