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Wavelet-based multifractal analysis of dynamic infrared thermograms to assist in early breast cancer diagnosis.

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Abstract

Breast cancer is the most common type of cancer among women and despite recent advances in the medical field, there are still some inherent limitations in the currently used screening techniques. The radiological interpretation of screening X-ray mammograms often leads to over-diagnosis and, as a consequence, to unnecessary traumatic and painful biopsies. Here we propose a computer-aided multifractal analysis of dynamic infrared (IR) imaging as an efficient method for identifying women with risk of breast cancer. Using a wavelet-based multi-scale method to analyze the temporal fluctuations of breast skin temperature collected from a panel of patients with diagnosed breast cancer and some female volunteers with healthy breasts, we show that the multifractal complexity of temperature fluctuations observed in healthy breasts is lost in mammary glands with malignant tumor. Besides potential clinical impact, these results open new perspectives in the investigation of physiological changes that may precede anatomical alterations in breast cancer development.

KEYWORDS:

breast cancer; infrared thermography; wavelet transform modulus maxima method

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