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Clinical applications of internal heat source analysis for breast cancer identification

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ABSTRACT. Nondestructive preoperative breast imaging techniques are widely used for breast cancer testing and diagnosis. This study aimed to evaluate the feasibility and efficacy of quantitative diagnosis via the thermal analysis of abnormal metabolism. Nine hundred forty-eight women who underwent breast biopsy from 2009 to 2013 were investigated. Thermal analysis was used to calculate the internal heat source (i.e., tumor) thermal power for each participant. The applicability and effectiveness of our approach were estimated using the chi-square test, kappa statistics (k), and odds ratios (OR). Breast density and tumor size were considered during this estimation. A thermal power $q = 0.2\ w$ was determined as the optimal separation threshold between breast cancer and benign disease. Moreover, good agreement ($k = 0.837$) with the gold-standard assessment (breast biopsy) was confirmed in 93.2% of the patients (N = 884/948), and the sensitivity and specificity were 94.2 and 92.9%, respectively. The results also found no significant differences in methodological accuracy between the fatty and dense breasts (OR = 1.194, P = 0.524). Furthermore, after dividing the cohort into three groups according to tumor size (T1: <2 cm; T2: 2 to 5 cm; T3: >5 cm), the tumor size had no effect on the proposed method (ORs = 1, P = 0.724). Internal heat source analysis can feasibly

and efficiently distinguish between breast cancer and benign disease.

Key words: Breast cancer; Diagnosis; Functional imaging; Heat source analysis; Gold-standard assessment

