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FIRIA: A Novel Non-Invasive Technique for Breast Cancer Diagnosis

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Abstract

Functional Infrared Resonance Imaging Assay (FIRIA), a novel non-invasive technique for medical diagnosis, was recently introduced by Jahanfar. In this study, we modeled the FIRIA signals associated with 17 inflammatory factors using Ab Initio Quantum Chemistry softwares. Our objective was to investigate the potential of FIRIA imaging for diagnosing and monitoring breast cancer using these factors. We obtained the molecular structures of the 17 inflammatory factors from the PubChem databases and the RCSB Protein Bank. After making structural corrections, we utilized the GAMESS software with the DFTB method, applying the OB2W0PT3 parameter. Subsequently, we modeled the FIRIA signals at five different lateral resolutions using Python. Statistical analyses of these 17 signals across all resolutions revealed significant differences in their signal patterns, allowing for clear differentiation between them. Among the modeled FIRIA signals, the most notable variations were found in interferon-gamma, plasmin, thrombin, and tryptase, which had an average RMSD of 4.99. Conversely, the lowest variation was observed in prostaglandin, leukotriene B4, 5-hydroxyeicosatetraenoic acid, and histamine, with an average RMSD of 2.28. Notably, we found that as the resolution increased, the RMSD values and the distinctions between the signals also rose. The findings highlight the high potential of the FIRIA imaging method for diagnosing crucial inflammatory factors and emphasize the feasibility of employing FIRIA for the diagnosis and monitoring of breast cancer and other cancers or diseases where these inflammatory factors hold clinical significance.

Key words: Radiology, Non-Invasive Diagnosis, Breast Cancer, Infrared Imaging, FIRIA