

## Abstract

years, significant advancements have been made in identifying novel biomarkers that hold promise for enhancing the early detection and prognostic accuracy and their potential applications in breast cancer management. Understanding the role of these biomarkers in early detection and prognosis can pave the way for personalized approaches to breast cancer diagnosis and treatment.

**Keywords:** Breast cancer; Biomarkers; Early detection; Prognosis; Circulating tumor cells (CTCs); Circulating tumor DNA (ctDNA); MicroRNAs; Exosomes; Radiomics; Personalized medicine

**Introduction**

Breast cancer is a heterogeneous disease with diverse molecular

positron emission tomography (PET). These radiomic features capture information about tumor morphology, texture, and spatial heterogeneity, offering insights into tumor biology and behavior.

In breast cancer, radiomic analysis has shown promise for predicting treatment response, assessing tumor aggressiveness, and predicting patient outcomes [8]. By leveraging advanced machine learning algorithms, radiomic features can be integrated with clinical and molecular data to develop predictive models for personalized risk stratification and treatment planning.

In the realm of breast cancer diagnosis and management, the quest for innovative biomarkers capable of early detection and accurate prognostication has been a focal point of research. These biomarkers offer the potential to revolutionize clinical practice by enabling more precise risk assessment, facilitating timely intervention, and guiding personalized treatment strategies.

**Early detection**: Early detection is paramount in improving breast cancer outcomes, as it allows for prompt initiation of treatment when the disease is more likely to be curable. Innovative biomarkers,