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Editorial

Theragnostic potential of biomarkers in early detection of breast cancer

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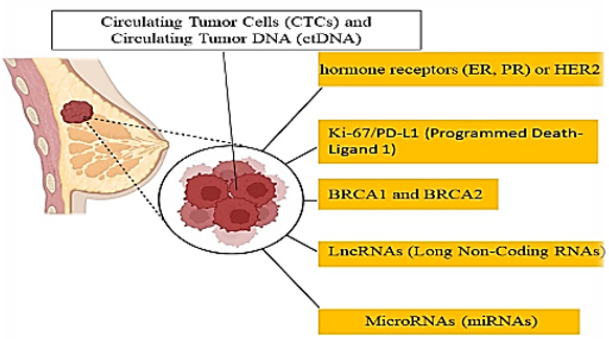

Novel Biomarkers used for the Detection of Breast Cancer

Theragnostic is a term derived from the combination of "therapy" and "diagnostics." It describes a tailored approach in the field of medicine that integrates both diagnostic and therapeutic capabilities into a single drug or strategy.[1] Theragnostic has gained importance in the field of breast cancer, providing a customized approach to both diagnosis and treatment of the illness. Molecular Imaging, such as PET/CT or MRI, is used in conjunction with targeted biomarkers to detect breast cancer cells. For example, radiolabelled tracers have the ability to attach to HER2 receptors, allowing for the visualization of breast cancer tumors that are HER2-positive. Biomarker identification may be achieved by theragnostic techniques, which often include the identification of particular biomarkers, such as hormone receptors (ER, PR) or HER2 status. These biomarkers can then inform the selection of appropriate therapies. Biomarkers play a vital role in the diagnosis, prognosis, treatment planning, and therapy monitoring of breast cancer. These are biomolecules present in blood, bodily fluids, or tissues, and they provide crucial insights into the behavior of cancer.[2] Hormone receptors, namely the estrogen receptor (ER) and progesterone receptor (PR), are proteins located in or on breast cells. These receptors have the ability to attach to estrogen and progesterone molecules, respectively. The existence of these receptors indicates that the breast cancer cells depend on hormones for their growth. Tumors that express estrogen receptor (ER) and/or progesterone receptor (PR) have a favorable response to hormone-based treatments, such as tamoxifen or aromatase inhibitors. Both of them serve as prognostic and predictive biomarkers. Breast cancers that are ER-positive have a more favorable outlook and are more likely to show a good response to hormone treatment.[3] HER2, also known as Human Epidermal Growth Factor Receptor 2, is a protein. HER2/neu: This is a protein that stimulates cellular proliferation. Approximately 15-20% of breast tumors exhibit amplification of the HER2 gene, resulting in excessive production of the HER2 protein, hence increasing the aggressiveness of the malignancy. HER2 serves as both a prognostic and predictive biomarker.

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HER2-positive breast tumors may be effectively treated with specific medicines such as trastuzumab (Herceptin), pertuzumab, and trastuzumab emtansine (T-DM1).[4] Ki-67 is a protein that is linked to the process of cell proliferation. The Ki-67 index quantifies the proportion of actively proliferating cells inside the tumor. A high Ki-67 value indicates rapid cancer growth.[5] Application: Ki-67 serves as a predictive indicator for prognosis. It is often used to assess the cancer's level of aggressiveness and the need of treatment. BRCA1 and BRCA2 are genes responsible for DNA damage repair. Genetic mutations in these specific genes greatly elevate the likelihood of getting breast cancer and are linked to hereditary breast cancer. Application: BRCA mutations serve as prognostic indicators. They have the ability to have an impact on therapy choices, such as the utilization of PARP inhibitors and the deliberation of preventative operations.[6–8] Biomarkers play a vital role in the management of breast cancer, providing essential information that guides diagnosis, treatment, and monitoring. As research advances, new biomarkers continue to emerge, offering the potential for even more personalized and effective treatment strategies. Understanding and utilizing these biomarkers is key to improving outcomes for breast cancer patients.

Conflict of Interest

None.

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