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Breast Cancer: The Potential of miRNA for Diagnosis and Treatment

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Abstract : MicroRNAs (miRNAs) are small single-stranded non-coding RNAs. They are almost 18-25 nucleotides long and very conservative through evolution. They are involved in adjusting the expression of numerous genes due to the existence of a complementary region, generally in the 3' untranslated regions (UTR) of target genes, against particular mRNAs in the cell. Also, miRNAs have been proven to be involved in cell development, differentiation, proliferation, and apoptosis. More than 2000 miRNAs have been recognized in human cells, and these miRNAs adjust approximately one-third of all genes in human cells. Dysregulation of miRNA originated from abnormal DNA methylation patterns of the locus, cause to down-regulated or overexpression of miRNAs, and it may affect tumor formation or development of it. Breast cancer (BC) is the most commonly identified cancer, the most prevalent cancer (23%), and the second-leading (14%) mortality in all types of cancer in females. BC can be classified based on the status (+/−) of the hormone receptors, including estrogen receptor (ER), progesterone receptor (PR), and the Receptor tyrosine-protein kinase erbB-2 (ERBB2 or HER2). Currently, there are four main molecular subtypes of BC: luminal A, approximately 50–60 % of BCs; luminal B, 10–20 %; HER2 positive, 15–20 %, and 10–20 % considered Basal (triple-negative breast cancer (TNBC)) subtype. Aberrant expression of miR-145, miR-21, miR-10b, miR-125a, and miR-206 was detected by Stem-loop real-time RT-PCR in BC cases. Breast tumor formation and development may result from down-regulation of a tumor suppressor miRNA such as miR-145, miR-125a, and miR-206 and/or overexpression of an oncogenic miRNA such as miR-21 and miR-10b. MiR-125a, miR-206, miR-145, miR-21, and miR-10b are hugely predicted to be new tumor markers for the diagnosis and prognosis of BC. MiR-21 and miR-125a could play a part in the treatment of HER-2-positive breast cancer cells, while miR-145 and miR-206 could speed up the evolution of cure techniques for TNBC. To conclude, miRNAs will be presented as hopeful molecules to be used in the primary diagnosis, prognosis, and treatment of BC and battle as opposed to its developed drug resistance.

Keywords : breast cancer, HER2 positive, miRNA, TNBC
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