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Abstract

A Review on Application of Nanotechnology for Early Breast Cancer Detection Based on Medical Imaging

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Abstract

Breast cancer is characterized by a distinct metastatic pattern involving the regional lymph nodes, bone marrow, lung and liver. Tumour cell migration and metastasis share many similarities with leukocyte trafficking, which is critically regulated by chemokines and their receptors. Detection of breast cancer and its metastasis at the earliest stage is important for the management and prediction of breast cancer progression. CT scans, X-ray, ultrasound imaging and MRI for various cancer detection. These traditional diagnostic methods however are not very powerful methods when it comes to cancer detection at very early stages. In general, they are quite useful clinically, but they are not enough and perfect. So if there is very few cells that have metastasized away from the primary at a distant site, they might miss them. It might say that there is nothing there when in fact there is something there. So especially micro metastasis,as they are called, smaller amounts of tumor burden, are the hardest things for all these technologies to solve. Due to the highly engineerable nature of nanotechnology, targeted nanoparticles exhibit significant advantages including increased contrast sensitivity, binding avidity and targeting specificity. A biomarker is characteristic of a specific state and therefore can be used as a marker for a target disease, like a protein, a fragment of a protein, DNA, or RNA-based. Cancer biomarkers, are an indication of cancer and by detecting them the existence of that specific cancer can be verified. Quantum dots, gold nanoparticles, and many other materials have been developed over the years for detecting .Gold nanoparticles (GNPs) have been in the bio-imaging spotlight due to their special optical properties. GNPs with strong surface-plasmon-enhanced absorption and scattering have allowed them to emerge as powerful imaging labels and contrast agents. Quantum dots are semiconducting, light-emitting Nano crystals that have emerged as a powerful molecular imaging agent since their discovery and they are an exciting material to work with due to their unique optical properties compared to traditional organic fluorescent labels. In this study we demonstrate the possibility of new methods for breast cancer detection at a very early stage with Nano technology and their effects on treatment in near future.

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