Progress and Challenges in the Diagnosis and Treatment of Brain Cancer Using Nanotechnology

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Abstract

Primary brain cancer or brain cancer is the overgrowth of abnormal or malignant cells in the brain or its nearby tissues that form unwanted masses called brain tumors. People with malignant brain tumors suffer a lot, and the expected life span of the patients after diagnosis is often only around 14 months, even with the most vigorous therapies. The blood-brain barrier (BBB) is the main barrier in the body that restricts the entry of potential chemotherapeutic agents into the brain. The chances of treatment failure or low therapeutic effects are some significant drawbacks of conventional treatment methods. However, recent advancements in nanotechnology have generated hope in cancer treatment. Nanotechnology has shown a vital role starting from the early detection, diagnosis, and treatment of cancer. These tiny nanomaterials have great potential to deliver drugs across the BBB. Beyond just drug delivery, nanomaterials can be simulated to generate fluorescence to detect tumors. The current Review discusses in detail the challenges of brain cancer treatment and the application of nanotechnology to overcome those challenges. The success of chemotherapeutic treatment or the surgical removal of tumors requires proper imaging. Nanomaterials can provide imaging and therapeutic benefits for cancer. The application of nanomaterials in the diagnosis and treatment of brain cancer is discussed in detail by reviewing past studies.

Keywords: brain cancer; challenges; diagnosis; nanotechnology; treatment.