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The Potential of Nano Pharmaceuticals to Change the Paradigm of Brain Tumor Therapy: A State-of-the-Art Review

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Abstract

Central nervous system tumors are abnormal proliferations of neuronal cells within the brain and spinal cord. They can be primary or secondary and place a heavy financial, psychological, and physical burden on individuals. The highly selective blood-brain barrier, which only permits specific molecules to flow into the brain parenchyma, inhibits the efficacy of pharmacological medicines. Treatment options include surgery, chemoradiotherapy, and targeted therapy. Despite advances in therapy over the past few decades, the overall morbidity and mortality rates are still high, emphasizing the need for improved therapeutic choices to improve survival and quality of life further. Nano pharmaceuticals have demonstrated encouraging outcomes in in vivo trials using microscopic particles to enhance bioavailability and selectivity. The most successful clinical results to date have been achieved by liposomes, extracellular vesicles, and biomimetic nanoparticles; nevertheless, clinical trials are required to confirm their safety, efficacy, affordability, longterm impact, and success in patients from various demographics. Nano pharmaceuticals have the potential to change the paradigm of therapy for brain tumors, allowing better outcomes as primary and adjunctive therapy.

Keywords: Brain tumor; blood-brain barrier; liposome; nano-pharmaceuticals; nanomedicine; neuro-oncology..

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