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Frontiers in the treatment of glioblastoma: Past, present and emerging

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Abstract

Glioblastoma (GBM) is one of the most aggressive cancers of the brain. Despite extensive research over the last several decades, the survival rates for GBM have not improved and prognosis remains poor. To date, only a few therapies are approved for the treatment of GBM with the main reasons being: 1) significant tumour heterogeneity which promotes the selection of resistant subpopulations 2) GBM induced immunosuppression and 3) fortified location of the tumour in the brain which hinders the delivery of therapeutics. Existing therapies for GBM such as radiotherapy, surgery and chemotherapy have been unable to reach the clinical efficacy necessary to prolong patient survival more than a few months. This comprehensive review evaluates the current and emerging therapies including those in clinical trials that may potentially improve both targeted delivery of therapeutics directly to the tumour site and the development of agents that may specifically target GBM. Particular focus has also been given to emerging delivery technologies such as focused ultrasound, cellular delivery systems nanomedicines and immunotherapy. Finally, we discuss the importance of developing novel materials for improved delivery efficacy of nanoparticles and therapeutics to reduce the suffering of GBM patients.

Keywords: Blood brain barrier; Drug delivery; Drug-loaded microchips; Emerging therapies; Focused ultrasound; Glioblastoma; Immunotherapy; Nanomedicine.

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