ABSTRACT

Biomater Sci. 2022 Jan 6. doi: 10.1039/d1bm01401c. Online ahead of print.

Radiotherapy for glioblastoma: clinical issues and nanotechnology strategies.

Li R(1), Wang H(1), Liang Q(1), Chen L(1), Ren J(1).

Author information:
(1)Cancer Center, Union Hospital, Tongji Medical College, Huazhong University of Science & Technology, Wuhan 430022, P. R. China. jhrenmed@hust.edu.cn.

Glioblastoma multiforme (GBM) is the most common primary brain cancer in adults with poor prognosis. Despite the current state of knowledge on its genetic characteristics, relatively little progress has been made in improving the treatment of patients with this fatal disease. Radiotherapy (RT) has been identified as a crucial treatment for GBM following surgical resection to improve both local control and survival. Unfortunately, radiotherapy resistance is frequently observed in GBM patients, which is the major reason for the high mortality rate of cancer patients. Radioresistance of GBM is often multifactorial and heterogeneous, and associated with the recurrence of GBM after surgery. Nanotechnology has gained increasing attention and has already been investigated for optimization of radiosensitization due to the unique properties of nanobiomaterials, such as photoelectric decay characteristics or potential as carriers for drug delivery to the central nervous system. A large body of preclinical data has accumulated over the past several years, in which nanotechnology-based strategies exhibit promising potential to enhance the radiosensitivity of GBM, both in cellular and animal models. In this review, we summarize the mechanisms of GBM radioresistance, including tumor cell-intrinsic factors as well as tumor microenvironment (TME). We further discuss current nano-biotechnology-based radiosensitizer in the treatment of GBM, summarize the latest findings, highlight challenges, and put forward prospects for the future of nano-radiosensitizers. These data suggest that nanotechnology has the potential to address many of the clinical challenges and nanobiomaterials would become promising next-generation radiotherapy sensitizers for GBM treatment.

DOI: 10.1039/d1bm01401c
PMID: 34989724