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Glioblastoma Multiforme: The Latest Diagnostics and Treatment Techniques

Agata Czarnywojtek [1] [2], Magdalena Borowska [1], Kamil Dyrka [3], Stefaan Van Gool [4], Nadia Sawicka-Gutaj [2], Jakub Moskal [5], Jeremi Kościński [5], Patryk Graczyk [1], Tomasz Hałas [1], Agnieszka Marta Lewandowska [6], Rafał Czepczyński [2], Marek Ruchała [2]

Affiliations

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Abstract

Background: Glioblastoma multiforme (GBM) is a WHO grade 4 glioma and the most common malignant primary brain tumour. Recently, there has been outstanding progress in the treatment of GBM. In addition to the newest form of GBM removal using fluorescence, three-dimensional (3D) imaging, tomoradiotherapy, moderate electro-hyperthermia, and adjuvant temozolomide (post-operative chemotherapy), new developments have been made in the fields of immunology, molecular biology, and virotherapy. An unusual and modern treatment has been created, especially for stage 4 GBM, using the latest therapeutic techniques, including immunotherapy and virotherapy. Modern oncological medicine is producing extraordinary and progressive therapeutic methods. Oncological therapy includes individual analysis of the properties of a tumour and targeted therapy using small-molecule inhibitors. Individualised medicine covers the entire patient (tumour and host) in the context of immunotherapy. An example is individualised multimodal immunotherapy (IMI), which relies on individual immunological tumour-host interactions. In addition, IMI is based on the concept of oncolytic virus-induced immunogenic tumour cell death.

Summary: In this review, we outline current knowledge of the various available treatment options used in the therapy of GBM including both traditional therapeutic strategy and modern therapies, such as tomotherapy, electro-hyperthermia, and oncolytic virotherapy, which are promising treatment strategies with the potential to improve prognosis in patients with GBM.

Key messages: This newest therapy, immunotherapy combined with virotherapy (oncolytic viruses and cancer vaccines), is displaying encouraging signs for combating GBM. Additionally, the latest 3D imaging is compared to conventional two-dimensional imaging.

Keywords: Cancer vaccines; Cell-free DNA; Chemotherapy; Fluorescence diagnostics; Gene mutation; Glioblastoma multiforme; HSV-G47Δ; Immunotherapy; Larotrectinib; Non-coding RNAs; Oncolytic virus; Targeted therapy; Temozolomide; Three-dimensional imaging; Tyrosine kinase inhibitors; Virotherapy.