Oncolytic Viruses

Treatment and implications for patients with gliomas

Cheryl Martin, MS, RN, FNP-C

CNE

BACKGROUND: Oncolytic viral therapies are increasingly being explored for the treatment of diverse cancer types, most notably melanoma. However, advances in the treatment of high-grade gliomas, and specifically glioblastoma multiforme (GBM), are the result of novel oncolytic viral therapies. Delta-24-RGD is one such therapy that has demonstrated promising results in phase 1 trials.

OBJECTIVES: The objective of this article is to provide an overview of Delta-24-RGD, highlighting considerations for nurses in diverse clinical, research, and advanced practice roles.

METHODS: A high-level overview of the pathophysiology of the Delta-24-RGD virus as it relates to GBM is presented. A case study is used to illustrate the course of care for a patient receiving this therapy.

FINDINGS: Delta-24-RGD has demonstrated remarkable clinical efficacy in the near to complete regression of GBM activity. Nurses may increasingly be caring for patients who are undergoing such therapy or have received it in the past. Understanding the mechanism of action, safe-handling implications, and expected patient care needs and treatment sequelae is important.

KEYWORDS
glioblastoma multiforme; gliomas; Delta-24-RGD; oncolytic; melanoma

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GLIOBLASTOMA MULTIFORME (GBM) IS A MALIGNANT HIGH-GRADE GLIOMA, emerging from astrocytes that comprise the supportive tissues of the brain (American Brain Tumor Association, 2014). GBM is more prevalent in men than women and accounts for about 3% of pediatric brain tumors (American Brain Tumor Association, 2014). About 24,000 new cases of brain and other nervous system tumors are estimated to occur in 2016 (National Cancer Institute, 2016), of which GBM is estimated to account for about 52% (American Association of Neurologic Surgeons, 2015). The hallmark of GBM, characterized by the World Health Organization (WHO) as a grade 4 tumor, is proliferative vascularization, whereby the tumor stimulates angiogenesis, the formation of its own blood vessels, via the overexpression of hypoxia inducible factor alpha and vascular endothelial growth factor (Cohen & Colman, 2015). These blood vessels are incompetent, or "leaky," and IV contrast seeps out into the brain and marks the tumors with enhancement on magnetic resonance imaging (MRI). GBM malignancy stems from the way the tumor infiltrates in and among healthy brain cells; this infiltrative nature contributes to treatment resistance and makes them incurable by surgery alone (Cohen & Colman, 2015). With treatment, the median survival is 14–16 months, with a five-year survival rate of less than 5% (Neagu & Reardon, 2015).

The standard of care treatment for glioblastoma is surgery with the goal of obtaining the most complete gross total resection as is safely possible. The location of the tumor is a key factor in surgical resection because maintaining optimal function after surgery is of paramount importance. The surgery is followed by a total 60 Gy radiation for 30 fractions (daily treatment for 30 days) and concurrent temozolomide (Temodar®), followed by 6–12 months of adjuvant temozolomide until recurrence (Neagu & Reardon, 2015). Serial MRI of the brain is used to reassess tumor status and progression, typically characterized by increased enhancement around the tumor bed, at which time progression to clinical trial may be indicated. Davis (2016) presents a detailed overview of glioblastoma and its treatment. Near or gross total resection is optimal for long-term survival; however, the survival rate has remained unchanged with the current standard of care for treatment (Lacroix et al., 2001).

The challenge inherent in the treatment of high-grade gliomas is treating the tumor and protecting healthy functioning brain cells, with the goal to preserve the patient's function. Oncolytic viruses are being used to treat high-grade gliomas with this goal in mind (Neagu & Reardon, 2015; Vecil & Lang, 2003). One oncolytic virus, the Delta-24-tripepetide arginylglycylaspartic acid (RGD) virus, is a genetically altered virus derived from the adenovirus and is currently being evaluated in phase 1 studies for the treatment