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Treatment-induced ripple effect: a systematic review exploring the abscopal phenomenon in Glioblastoma multiforme

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Abstract

Purpose: This systematic review aimed to collate and synthesize the available literature on the abscopal effect in Glioblastoma multiforme (GBM) neoplasms, focusing on the reported biochemical mechanisms driving the abscopal effect.

Methods: A systematic search was conducted in PubMed, Cochrane Database of Systematic Reviews, and Epistemonikos from inception to May 1, 2023. Studies exploring the abscopal effect in GBM were included. The Clinical Relevance Assessment of Animal Preclinical research (RAA) tool was used to assess methodological quality of preclinical studies. Data on preclinical models, biochemical mechanisms, and outcomes were extracted and synthesized systrmatically.

Results: Out of a total of 7 studies, five preclinical studies met the inclusion criteria. The studies utilized various in vivo mouse models, including bilateral tumor models and immunohumanized mice. Key biochemical mechanisms identified included immunogenic cell death, danger-associated molecular pattern release, macrophage activation, and enhanced T cell responses. Combinatorial approaches involving oncolytic virotherapy, nanoparticle-based treatments, radiation therapy, and immune checkpoint inhibitors showed promise in inducing abscopal effects. Significant tumor growth inhibition and improved survival were reported in treated animals. However, the RAA analysis highlighted concerns regarding research transparency and internal validity across studies.

Conclusions: This systematic review highlighted the potential of the abscopal effect in GBM, demonstrating its ability to enhance anti-tumor immune responses both locally and systemically. The synergistic effects of combinatorial approaches showed promise for improving outcomes. However, the low methodological quality of existing studies underscored the need for more rigorous preclinical research. Future studies should focus on improving research transparency, exploring the abscopal effect in other primary CNS neoplasms, and translating these findings into clinical trials to assess safety and efficacy in humans.

Keywords: Abscopal effect; CpG; Glioblastoma; Mouse; Oncolytic adenovirus; Primary central nervous system tumor.