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Letter to the Editor

The Future Perspective of the Combination of Artificial Intelligence, Oncolytic Virotherapy, and Immunotherapy Against Colorectal Cancer

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To the Editor,

Colorectal cancer (CRC) is still a major global health concern, ranking among the top three most commonly diagnosed cancers and one of the leading causes of cancer-associated deaths. [1] Despite significant advancements in screening, surgical techniques, and systemic therapies, outcomes for advanced or metastatic CRC remain poor. Innovative strategies that combine multiple modalities may provide superior therapeutic efficacy.

One promising approach is the combination of artificial intelligence (AI), oncolytic virotherapy (OV), and immunotherapy. Oncolytic viruses are engineered or naturally occurring viruses that selectively replicate and lyse in tumor cells, thus releasing tumor-related antigens and promoting immunogenic cell death. This process reprograms the tumor microenvironment from an immunologically "cold" to "hot" state, making it more sensitive to immune checkpoint blockade therapies. [2]

Immunotherapy, especially immune checkpoint inhibitors (ICIs), has displayed durable responses in a subset of CRC patients, particularly those with microsatellite instability-high (MSI-H) or mismatch repair-deficient (dMMR) tumors. However, the majority of CRC cases are microsatellite-stable (MSS) and do not respond to ICIs alone. OV could act as an adjuvant to increase immunotherapy responsiveness in these resistant tumors. [3,4]

AI further enhances this therapeutic trial by enabling data-driven patient classification, predicting treatment outcomes, and guiding personalized treatment regimens. AI tools can analyze histopathological, genomic, transcriptomic, and radiomic data to find ideal candidates for OV and ICI therapies. Moreover, AI can help design new oncolytic vectors tailored to individual tumor profiles. [5,6]

The convergence of these technologies could dramatically change the paradigm of CRC treatment. Future clinical trials should concentrate on validating AI-related patient selection algorithms, optimizing OV-immunotherapy combinations, and integrating real-time AI-driven monitoring of treatment responses.

In conclusion, the synergistic application of AI, OV, and immunotherapy holds vast promise for transforming CRC therapy. This multidisciplinary approach could pave the way for a more precise, effective, and individualized oncology vision.

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CONFLICT OF INTEREST

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