The Future Perspective of Combination of Artificial Intelligence, Oncolytic Virotherapy, and Immunotherapy against Gastric Cancer

Piruz Shadbash[*1,2]

1. Basic and Molecular Epidemiology of Gastrointestinal Disorders Research Center, Research Institute for Gastroenterology and Liver Diseases, Shahid Beheshti University of Medical Sciences, Tehran, Iran

2. Department of Microbiology and Microbial Biotechnology, Faculty of Life Sciences and Biotechnology, Shahid Beheshti University, Tehran, Iran.

***Corresponding author:** Piruz Shadbash

E-mail: shadbashpiruz@gmail.com

Tel. (+98) 9366522792

Dear Editor,

Gastric cancer (GC) is one of the leading causes of cancer deaths worldwide, especially in East Asia. Despite recent advances in diagnosis and therapy, the prognosis for advanced GC is poor due to late diagnosis, tumor heterogeneity, and immune evasion mechanisms. Therefore, there is an urgent need for innovative and synergistic approaches to improve treatment outcomes. The integration of artificial intelligence (AI), oncolytic virotherapy (OV), and immunotherapy has transformative potential in this context.

Artificial intelligence has revolutionized cancer care through its ability to process large-scale datasets and identify patterns beyond human ability. AI algorithms have shown significant performance in detecting early-stage GC from endoscopic and histopathological images with high accuracy, which helps in timely diagnosis and risk stratification (1). Additionally, machine learning models are being increasingly used to forecast patient response to immunotherapies and to optimize therapy planning (2).

Oncolytic viruses selectively replicate in tumor cells, causing direct oncolysis and increasing anti-tumor immune responses. In GC models, engineered viruses like adenovirus, reovirus, and herpes simplex virus have demonstrated promising preclinical efficacy (3). OV-induced immunogenic cell death can convert “cold” tumors into “hot” tumors, thereby enhancing the responsiveness to immune checkpoint inhibitors (ICIs) (4).

Immunotherapy, especially ICIs targeting PD-1/PD-L1 and CTLA-4, has demonstrated modest success in GC, with only a subset of patients responding favorably. Combining OV with ICIs has emerged as a rational approach to overcome resistance and increase efficacy. Clinical trials investigating this synergy are currently underway and may redefine treatment paradigms (5).

The integration of AI can further strengthen this combination. AI-based analysis of tumor genomics and immune landscapes can guide the selection of optimal oncolytic vectors and immunotherapy regimens. Predictive modeling may also detect biomarkers for response, enabling real-time adaptation of treatment (6).

In conclusion, the convergence of AI, oncolytic virotherapy, and immunotherapy provides a multifaceted and personalized strategy against gastric cancer. Collaborative translational research and clinical validation are crucial to harness the full potential of this triad. We support accelerating interdisciplinary efforts and the establishing of AI-based clinical trials to pave the way for precision oncology in GC.

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