9 Conclusion

The future development of immunotherapy in advanced ovarian cancer will rely on the expansion of novel immune targets and the optimization of mechanism-driven combination strategies. Beyond the classical PD-1/PD-L1 and CTLA-4 pathways, emerging checkpoints such as LAG-3, TIM-3, and TIGIT, as well as immunosuppressive components of the tumor microenvironment, are becoming important therapeutic targets. Rational combinations integrating immune checkpoint inhibitors with anti-angiogenic agents, PARP inhibitors, metabolic modulators, or cell-based therapies may help convert "cold" tumors into "hot" ones, thereby enhancing treatment responsiveness. Current evidence suggests that combination therapies are more promising than monotherapy; however, their benefits remain limited and are often accompanied by increased toxicity. This highlights the need for further optimization of treatment regimens, dosing, and sequencing based on underlying biological mechanisms to achieve a balance between efficacy and safety.

At the same time, precision medicine is expected to play a central role in advancing immunotherapy. With the development of multi-omics technologies, single-cell sequencing, and spatial transcriptomics, the molecular heterogeneity and immune landscape of ovarian cancer are being increasingly elucidated, enabling biomarker-guided individualized treatment strategies. Biomarkers such as PD-L1 expression, tumor mutational burden (TMB), homologous recombination deficiency (HRD), tumor-infiltrating lymphocytes (TILs), and immune-related gene signatures are being integrated into composite predictive models to better identify patients who are most likely to benefit. In addition, innovative clinical trial designs, such as basket trials, umbrella trials, and adaptive platform trials, along with artificial intelligence-assisted analyses, are expected to further refine treatment selection and improve the precision of immunotherapy.

Overall, although immunotherapy has demonstrated durable clinical benefits in a subset of patients, its overall efficacy in advanced ovarian cancer remains limited and has not yet translated into significant improvements in overall survival. Therefore, it should currently be regarded as a promising but still evolving component of multimodal treatment rather than a standalone approach. Future progress will depend on high-quality, biomarker-integrated randomized clinical trials, as well as strengthened multidisciplinary collaboration and translational research efforts. Only through the integration of mechanistic insights, robust clinical evidence, and advanced technologies can immunotherapy move from a promising strategy to a broadly effective treatment, ultimately improving long-term survival and quality of life for patients with advanced ovarian cancer.

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Conflict of Interest Disclosure

The author affirms that this research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

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