Evaluating the Safety and Efficacy of Y-90 Radioembolization in Combination with Immunotherapy for Hepatocellular Carcinoma

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Introduction

Hepatocellular carcinoma (HCC) is the most prevalent type of primary liver cancer and the third leading cause of cancer-related mortality globally. Yttrium-90 transarterial radioembolization (Y-90 TARE) is a catheter-directed locoregional therapy that directly induces cytotoxic injury to cancer cells while minimizing damage to healthy tissue. Y-90 TARE can be combined with immune checkpoint inhibitor (ICI) therapy to induce direct tumor cytotoxicity while also targeting the specific immunologic profile of the tumor cells to prevent progression of disease from two angles simultaneously. This educational exhibit discusses latest advances in the use of Y-90 TARE in combination with immune checkpoint inhibitors (ICI).

Methods

A review of the latest clinical trials and studies of Y-90 TARE/ICI combination treatment was conducted to characterize the safety and efficacy of this emerging treatment for HCC. Findings are presented in text and figure format, identifying limitations and future directions of this research.

Table 1: Comparison of Immune Checkpoint Inhibitors Commonly Combined with Y-90 TARE

Immune Checkpoint Inhibitor	Mechanism	Other Indications
Nivolumab	Programmed cell death-1 ligand (PD-L1) inhibition	Melanoma, Non-small cell lung cancer
Durvalumab	PD-L1 inhibition	Urothelial carcinoma, Small cell lung cancer
Pembrolizumab	PD-1 inhibition	Head and neck squamous cell cancer, Melanoma

Table 2: Results of Trials of Y-90 TARE/ICI

Paper	Study Type	ICI used	Median Time-to-Progression	Rate of Serious Adverse Effects
Lee et al. (2023)	Phase I/IIa Trial (n = 24)	Durvalumab	15.2 months	16.7%
Yu et al. (2024)	Pilot Study (n = 27)	Pembrolizumab	9.95 months	48.1%
Tai et al. (2025)	Phase II Trial (n = 40)	Nivolumab	5.6 months	14%

Conclusion

Early-stage clinical trials indicate that the use of Y-90 TARE followed by systemic ICI therapy is effective in preventing progression of disease. However, some studies indicate a less-than-favorable adverse effect profile. These conclusions are limited by the fact that these studies have a low number of participants, as well as the fact that there is no comparison to Y-90 TARE alone or ICI therapy alone. These studies are also limited in their assessment of dosimetry, as well as optimal order and timing of the combination therapy. Further studies of this treatment strategy should incorporate more patients and compare their outcomes with other modes of HCC treatment.

References

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