Tumor-Infiltrating Lymphocyte (TIL) Therapy in Pediatric Malignancies

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Tumor-Infiltrating Lymphocyte (TIL) therapy has emerged as a transformative approach in cancer immunotherapy, offering a novel strategy for patients whose malignancies fail to respond to conventional treatments such as chemotherapy, radiation, and targeted therapies. While the most compelling evidence to date comes from studies in adult solid tumors particularly melanoma and certain epithelial cancers the application of TIL therapy in pediatric oncology is an evolving and highly promising area of investigation. Pediatric cancers such as neuroblastoma, leukemia, and sarcomas represent a unique challenge, given their distinct tumor biology and the often-limited availability of TILs within these tumors. The therapeutic process involves isolating naturally occurring lymphocytes from a patient's tumor microenvironment, expanding them ex vivo under optimized laboratory conditions, and reinfusing them back into the patient to enhance the body's capacity to recognize and eliminate malignant cells. Although pediatric tumors tend to yield fewer infiltrating lymphocytes compared to their adult counterparts posing limitations on expansion and efficacy recent preclinical studies and early-phase clinical trials have reported encouraging outcomes. These include measurable tumor regression and, in some cases, durable disease control, particularly when TIL therapy is paired with lymph depleting regimens and cytokine support to optimize immune activation.

Despite these advances, significant barriers remain before TIL therapy can be fully integrated into the pediatric oncology landscape. Key challenges include improving methods for efficient extraction and large scale expansion of TILs from small tumor samples, identifying reliable biomarkers to predict which patients are most likely to benefit, and addressing immune evasion strategies employed by pediatric cancers. Furthermore, the developing immune system of children may influence both the therapeutic response and potential toxicity profile, underscoring the need for pediatric-specific clinical and translational research.

This presentation will provide an overview of TIL therapy, review the current state of ongoing clinical trials in pediatric populations, and discuss major scientific and clinical hurdles that must be overcome. It will also highlight future directions including combination strategies with checkpoint inhibitors, genetic engineering of TILs, and advances in tumor immunobiology that may help unlock the full therapeutic potential of TIL therapy in children with high-risk or refractory malignancies. Ultimately, by bridging the gap between early research and clinical application, TIL therapy holds the potential to redefine treatment paradigms and improve survival outcomes in pediatric oncology.