Multi-Modal MR/PET Imaging of Natural Killer Cell Immunotherapy

Against Glioblastoma with Correlated Histology

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Hypothesis: Immunotherapies hold great promise for treatment of highly resistant cancers, such as glioblastoma (GBM). We hypothesized that high powered imaging can be effectively combined to quantitatively assess the therapeutic efficacy of human derived natural killer (hNK) cells in an orthoptic xenografted mouse model of GBM.

Methods: Tumor take (TT) was established via fluorescence. Mice in the treatment (*n*=5) and control (*n*=4) groups were given IV hNK cells and physiological saline, respectively. MRI and PET scans were performed four and six weeks after tumor implantation. Histological slices were taken at time of death. Software analysis of tumor volume, standardized uptake value (SUV), and tumor-to-brain ratio (TBR) was conducted via Qimage and Indica Labs - HALO.

Results: Mean growth rates are as follows: T1 volume (mL) – 4.1 in the control group vs 2.3 in treatment. T2 volume (mL) – 6.0 in control vs 2.7 in treatment. PET volume (mL) – 3.1 in control vs 2.1 in treatment, SUV (g/mL) – 5.4 in control vs 3.0 in treatment. Two-tailed t-test analysis showed statistical significance ($p < 0.01$) in T1 volume data.

Conclusion and Potential Impact: Treatment group mice showed a trend in reduction in growth rate of tumor volume and SUV compared to control, with a correlated lower histology TBR, suggesting effective *in vivo* assessment of hNK therapeutic efficacy in the mouse model of GBM via MR/PET imaging. Future trials should provide a larger population size to increase reliability, precision and power.