Background: Patients with glioblastoma multiforme (GBM) brain tumors provide a clinical population for studying the brain structural response to a lesion. GBM patients survive a median of 12 months with 3-10% living longer than five years. However, little is known about what brain and tumor factors relate to survival. This study assesses cognitive neural compensation by examining the contralesional hemisphere in GBM patients.

Research Question: In patients with temporal lobe GBM tumors, what is the relationship between structural compensation in the contralesional hemisphere and days of survival?

Methods: Contralesional Temporal Lobe Cortical Thickness and Subcortical Structure Volume and Shape Compensation by Examining the Contralesional Hemisphere in GBM Patients.

We computed contralesional cortical thickness and subcortical structure volume and shape compensation by examining the contralesional hemisphere in GBM patients. What brain and tumor factors relate to survival. This study assesses cognitive neural compensation by examining the contralesional hemisphere in GBM patients.

Results: Long-term survivors have greater contralesional entorhinal and transverse temporal cortical thickness.

Regions within the temporal lobe were tested for significant difference between long-term survivors and short-term survivors. Scatterplots of cortical thickness of regions within the temporal lobe and hippocampal volume of right temporal lobe tumor patients. Filled circles are scaled to tumor size. Vertical line separates short-term and long-term survivors (1095 days). Horizontal line indicates ROI-specific median thickness. Top left: entorhinal thickness; Top right: transverse temporal thickness; Bottom left: temporal lobe thickness average; Bottom right: hippocampal volume.

Methods: Hippocampal Volume

Methods: Tumor Kinetics

Methods: Image and Statistical Analysis

We computed contralesional cortical thickness and subcortical structure volume and shape using pre-treatment T1 weighted with gadolinium contrast magnetic resonance imaging (MRI). Patients who lived longer than three years were considered long term survivors.

Cortical thickness for the contralesional hemisphere is determined by calculating the distance between the pial and white surfaces. Freesurfer pipelines were modified to only analyze the contralesional hemisphere as the tumor would cause the "fix topology" step to fail. Pial surface = red; white/grey boundary matter = yellow. Tumor is bright white spot enhanced by the gadolinium.

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Conclusions: In long-term survivors with GBM, contralesional cortex compensates for tumor effects in right temporal lobe tumors. Work is ongoing to further understand the complex relationship between contralesional brain structural measures and survival, and their relationship with tumor characteristics.

Future Directions: Future studies will assess tumors as well as structural compensation in other areas of the brain.

- Other tumor factors (diffusion/proliferation, velocity) will be considered.
- Longitudinal clinical imaging for each patient will be analyzed for changes in thickness and volume.
- Structural compensation will be correlated with performance on cognitive and neuropsychology tests.
- Resting-state fMRI will also be analyzed to determine disruptions in networks.

Supported by NIH T32 GM080812 (Medical Scientist Training Program), T32 NS047987 (Training Program in the Neuroscience of Human Cognition), and the ENDURES grant from the James S. McDonell Foundation.

Contact: christinepaula.delosangeles@fsm.northwestern.edu

Plain Text Representation:

Preliminary Analysis of Contralesional Hemisphere Hippocampal Volume and Cortical Thickness as a Predictor for Survival in a subset of Glioblastoma Multiforme Patients

C. Paula de los Angeles1, Kathryn I. Alpert2, Joshua Jacobs3, Alfred W. Rudenmaker4, Jeffrey J. Raizer5, Kristin Swanson6,7, Alfred W. Rademaker2, Joshua Jacobs3, Kathryn I. Alpert2

1Medical Scientific Training Program, 2Northwestern University Interdepartmental Neuroscience Doctoral Program, 3Department of Psychiatry and Behavioral Sciences, 4Department of Neurosurgery, 5Department of Preventative Medicine - Biostatistics, 6Department of Neurology, 7McComisck School of Engineering, 8Department of Radiology

Northwestern University Feinberg School of Medicine

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