

MULTI-PARAMETRIC IMAGING OF TUMOR HETEROGENEITY USING NONINVASIVE, NON- RADIATIVE WATER DIFFUSION

Benzinger, Tammie, Guzman, Gloria, Wang, Qing, Wang, Yong

Markiewicz, Gregory

T-016652

Background

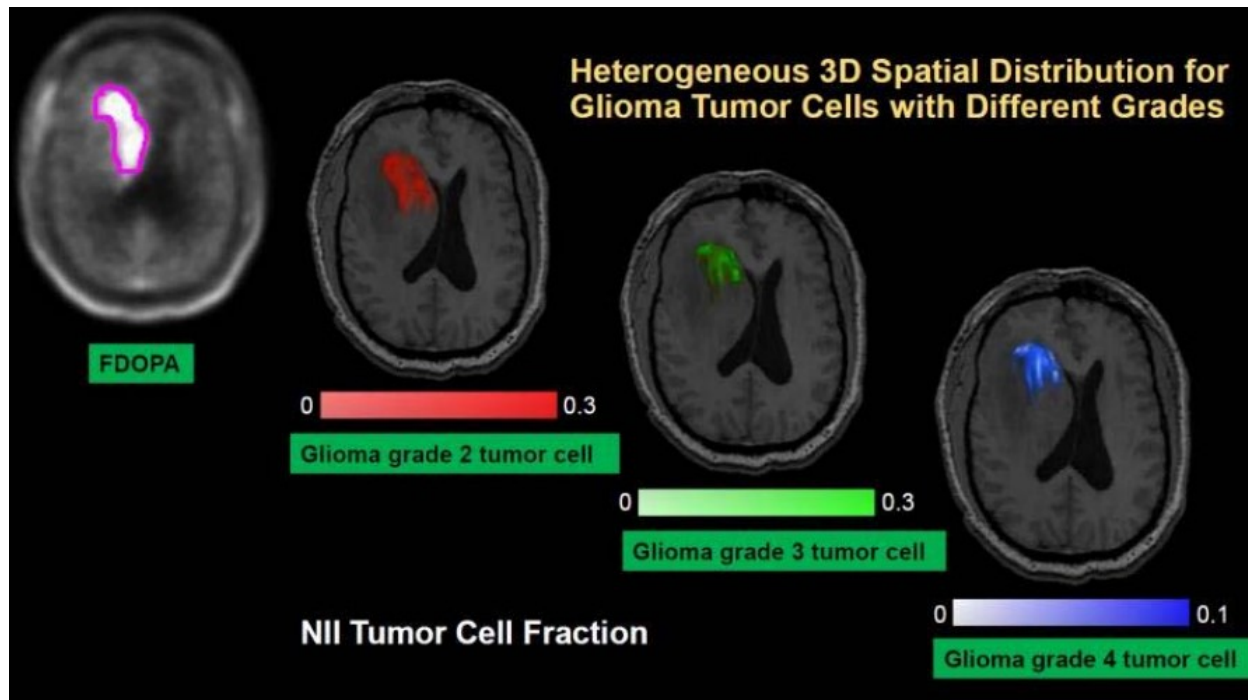
Currently, biopsies are the only definitive method to diagnose a brain tumor. While PET-CT is used for initial imaging and monitoring of the tumor, after completion of treatments, a 6-8-week delay is usually implemented to avoid false-positive results. Yet, the delay could also result in a loss of a therapeutic window. Additional challenges in monitoring are presented by tumor heterogeneity. The extent of tumor cells, edema and vascular structures may contribute to the metastatic potential and progression of the tumor and should be monitored. Thus, there is a strong need for a non-invasive method that can be utilized for diagnoses of brain tumors, characterization of tumor heterogeneity, and for immediate assessment post-treatment.

Technology Description

A multi-parametric, post-processing technique for Diffusion Weighted MRI data called Neuro-Immune Imaging (NII), has been developed that can measure tumor cell microstructures, edema, and vascular structures from a single clinical scan. The basis of the NII technique is Diffusion Basis Spectral Imaging (DBSI) that uses multiple-tensor modelling of diffusion weighted MRI signals to separate fibrous components (anisotropic diffusion) from other cells (isotropic diffusion). By further separating the isotropic diffusion component, the technique is able to distinguish and grade gliomas, as well as monitor the perfusion associated with increased vasculature. Our method can be used immediately after treatment since there is no concerns regarding tracers. Additional strengths are that the technique can be used on Diffusion MRI data that has already been acquired and the only costs are computational in nature. We expect that this multi-parametric technique can also be applied to conditions such as Alzheimer's and to other cancers. NII can also be used to evaluate the immune response and true tumor changes following immunotherapy.

Stage of Research

We have used the multi-parametric method to distinguish and grade gliomas for 8 patients. The imaging findings have excellent correlations with the pathology findings and accurately assess the heterogeneity of tumors. From the clinical data we have developed a NII-specific scale to grade gliomas (below).



Publications

Wang Q, Perez-Carrillo GJG, Ponisio MR, ... Wang Y. (2019). [Heterogeneity diffusion imaging of gliomas: initial experience and validation](#). *PLoS One* 14(11): e0225093.

Patents

- US 9,494,669
- US 10,962,619
- US 20210177348

Related Web Links: Wang [Profile](#) & [Lab](#)