Abstract #1984

The objective of this study was to determine the neuropathological correlates of in vivo magnetization transfer imaging (MTI) and diffusion tensor imaging (DTI) MRI measures using a novel mouse model of inflammatory cerebral demyelination. Conventional MRI is routinely utilized to evaluate the efficacy of therapeutic agents in multiple sclerosis (MS) clinical studies. However, the relationship between non-conventional, in vivo imaging measures and the underlying pathophysiological processes remains poorly understood. In order to maximize the information gleaned from MRI data and appropriately steer clinical development of novel therapeutics, we have performed a rigorous correlation analysis between in vivo 3D MRI measures and gold-standard, post-mortem, quantitative immunohistochemistry (qIHC) measures in mice with focal inflammatory/demyelinating lesions using 3D PERMITS™.

**Methods**

- **Co-registration of DTI and MTR MRI Data to Quantitative Immunohistochemistry**
  - Co-registration of DTI and MTR MRI data to quantitative immunohistochemistry (qIHC) was achieved using Biospective’s PERMITS™, a comprehensive solution for the analysis of quantitative MRI and histology. PERMITS™ is an integrated, multi-step, user-friendly application that provides the ability to automatically register high-resolution MRI and histology data to high-resolution, multi-modal imaging data. This allows for the quantification of myelin and non-myelin components of the brain, providing a comprehensive assessment of the neuroanatomical and pathological changes associated with disease progression.

- **Focal Brain Lesion in C57Bl6 MOG/EAE and MRI Acquisition**
  - The focal lesions were clearly visible on the MR images, and co-registration between MRI and qIHC data was achieved using Biospective’s PERMITS™ technology. The lesions demonstrated variable degrees of demyelination and IgG staining across animals.

- **Lesion-Based Analysis**
  - The focal lesions were visible on the MRI images, and co-registration between MRI and qIHC data was achieved using Biospective’s PERMITS™ technology. The lesions demonstrated variable degrees of demyelination and IgG staining across animals.

- **Conclusion**
  - The focal lesions were clearly visible on the MRI images, and co-registration between MRI and qIHC data was achieved using Biospective’s PERMITS™ technology. The lesions demonstrated variable degrees of demyelination and IgG staining across animals. Strong correlations were observed between demyelination and both MTR & DTI FA in the demyelinated corpus callosum ROI. It will be important to examine these correlations in the context of remyelination. A strong correlation was also observed between IgG and DTI FA in the cortical ROI. The combination of in vivo MRI and post-mortem 3D qIHC studies is a valuable strategy for interrogating the relationship between quantitative neuroimaging and gold-standard neuropathology measures.

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