**Introduction**

Functional imaging techniques have been developed predominantly to improve visualisation of epileptogenic foci in grey matter for focal-onset epilepsy. However, few techniques assess the degree of ictal-associated connectivity between different zones in the epileptogenic cortex through white matter (WM) axonal pathways, thus neglecting a crucial step towards understanding meaningful connectivity in epileptic networks. Probabilistic subtracted post-ictal Diffusion Tensor Imaging (pspi-DTI) is a novel imaging technique that aims to identify transient water diffusion changes during the early post-ictal phase in such pathways.

In our previous work (Rossi et al., 2010), transient diffusion changes in white matter were localized following stereotactic dyscognitive seizures without generalization by computing the difference in FA between inter-ictal (baseline) and post-ictal DTI datasets. In contrast, pspi-DTI is a second generation algorithm which computes a voxel-wise parametric t-test to test the hypothesis that a change exists in diffusion measurements (FA and Tr) between the inter-ictal and post-ictal state in a single voxel and its immediately neighboring voxels.

In addition to other appropriate noninvasive multi-modality testing (scalp EEG, MEG, PET), a modality testing (scalp EEG, MEG, PET) is a novel imaging technique that aims to identify localized following stereotypic dyscognitive seizures without generalization by computing the difference in FA between inter-ictal (baseline) and post-ictal DTI datasets. In contrast, pspi-DTI is a second generation algorithm which computes a voxel-wise parametric t-test to test the hypothesis that a change exists in diffusion measurements (FA and Tr) between the inter-ictal and post-ictal state in a single voxel and its immediately neighboring voxels.

**Methods**

In addition to other appropriate noninvasive multi-modality testing (scalp EEG, MEG, PET), a modality testing (scalp EEG, MEG, PET), a third generation algorithm which computes a voxel-wise parametric t-test to test the hypothesis that a change exists in diffusion measurements (FA and Tr) between the inter-ictal and post-ictal state in a single voxel and its immediately neighboring voxels.

**Results**

Our pspi-DTI technique detected regions with statistically significant transient changes in FA and increases in Tr following stereotactic dyscognitive seizures without generalization secondarily for each patient. Furthermore, pspi-DTI datasets complemented grey matter dominant blood flow patterns captured by subtracted ictal SPECT co-registered to MRI (SISCOM).

The method was tested in 5 different patients who were candidates for responsive neurostimulation (RNS) therapy, to determine significant changes in white matter diffusion properties. Four of the five patients were implanted (AK was not implanted), we found a spatial correlation between SISCOM and pspi-DTI in all patients.

**Conclusions**

Pspi-DTI is a novel innovative technique developed in our laboratory to test transient changes in diffusion properties of white matter secondary during the early post-ictal phase. The identified alterations convey valuable information about the ictal-associated propagation pathways involved in the epileptogenic network. This information can be later used to predict optimal depth placement implant sites for direct neurostimulation therapy for modulating the maximal extent of the epileptogenic network.

**References**