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New methods to identify and cure a common cause of medically intractable epilepsy

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Epilepsy is the most common neurological disease in childhood and fourth most common in adults. Up to 30% of cases cannot be controlled with medication. The most common cause of these medically refractory seizures is a focal cortical dysplasia (FCD), a localized region in the cortex where neuronal formation, migration or lamination is abnormal. These are often seen with high resolution MRI and are easily resected with a cure rate of up to 85%. However, FCDs are also very often "cryptogenic", extremely small, subtle or inapparent on MRI. This talk will explore why conventional neuroimaging frequently fails and the development of new methods of image processing which combine MRI and positron emission tomography (PET) in novel ways to expose otherwise invisible FCDs. This process permits successful surgical cures of an otherwise lifelong disease with a significant morbidity and mortality.

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Regional Homogeneity (ReHo) changes in new onset versus chronic Benign Epilepsy of Childhood with Centrotemporal Spikes (BECTS): A resting state fMRI study

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Objective: The purpose of this study was to investigate regional homogeneity (ReHo) in children with new-onset drug-naive Benign Epilepsy with Centrotemporal Spikes (BECTS), chronic BECTS and Healthy Controls (HC) using the Regional Homogeneity (ReHo) method applied to resting state fMRI data.

Methods: Resting state fMRI data was collected from three groups of children aged 6 to 13, including new onset drug naive BECTS, chronic BECTS with medication and HC; the data analyzed by ReHo method. Mandarin school exams scores were acquired and compared across groups.

Results: There were three main findings. Firstly, compared with HC, abnormally increased ReHo was observed in bilateral sensorimotor regions in new onset BECTS which normalized or even reversed in the chronic BECTS group. Secondly, enhanced ReHo was found in the left frontal language region in the two BECTS groups with even higher ReHo value in the chronic group. Lastly, decreased ReHo was found in regions of the default mode network (DMN), bilateral occipital lobes and cerebellum in both the new onset and chronic BECTS groups, lower in chronic BECTS. Behavioral analyses of school scores showed the chronic BECTS group got lower scores compared to HC with to statistically significant difference ($p<0.05$).

Conclusion: The coherence of low frequency fluctuations is disrupted in sensorimotor, language and DMN in new-onset BECTS. Some of these effects seem to be selectively normalized in chronic BECTS, thus allowing us to explore possible chronicity and AED-induced effects on BECTS. Abnormal ReHo in left language and DMN regions could be responsible for impairments of cognitive function.

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