P052_Default mode network dysfunction in a patient with epilepsy in the precuneus

Centeno M.1, Perani S.1, St Pier K.2, Lemieux L.3, Clayden J.1, Clark C.1, Pressler R.2, Cross H.1,2, Carmichael DW.1

1 Imaging and biophysics, UCL Institute of child health, 30 Guilford Street, WC1H 1EH, London, UK
2 Epilepsy Unit, Great Ormond Street Hospital NHS Foundation Trust, Great Ormond Street WC1N 3JH, London, UK
3 Department of Clinical and Experimental Epilepsy, UCL Institute of Neurology, Queen Square, WC1N 3BG, London, UK

Background: Default mode network (DMN) deactivations have been reported in patients with epilepsy associated with ictal and interictal activity. This network is involved in cognitive processes and conscious rest. Failure to suppress the DMN during a task is associated with poor performance. Here, we investigated a patient with focal epilepsy located in the precuneus, a key hub within the DMN. We used EEG-fMRI to compare areas involved in interictal epileptiform discharges (IEDs) and analysed the functional connectivity of the DMN during rest and an attention-directed task.

Methods: A 17 y.o. male with focal epilepsy was studied. MRI showed an abnormality in the right precuneus. Ictal onset on scalp and intracranial EEG confirmed the epileptic focus location to right precuneus. Post-surgical tissue analysis revealed focal cortical dysplasia. Seizures recurred after surgery.

Four EEG-fMRI sessions were recorded in 1.5T MRI. During 2/4 sessions a paradigm was shown with alternating blocks of movie and rest. For the remaining sessions the patient was told to rest with eyes closed. The same EEG-fMRI protocol was repeated in 8 controls.

Three types of analyses were applied: A) Visually identified IEDs were entered into a general lineal model (GLM) using SPM8 along with movement and cardiac confounds. IED-related BOLD responses were found with an F-test across all 4 sessions. B) The paradigm blocks were entered into a GLM using SPM8. Attention-directed task responses were found in each individual and then entered in a second level analysis to compare responses between the patient and controls. C) The DMN was separated using independent component analysis as implemented in FSL. DMN connectivity compared both between sessions and between controls and the patient.

Results: EEG-fMRI IED-correlated analysis revealed areas of significant (p<0.001 unc) BOLD change in the right precuneus concordant with the epileptic focus. During the movie periods, the patient showed activation of the DMN in addition to the attention networks differently to the control group (p<0.05 FWE). Patent’s functional connectivity of DMN was increased within the network and to other cognitive networks during rest and the task.

Conclusion: EEG-fMRI revealed a focus consistent with other localisation methods and also suggested a wider extent of FCD than was resected consistent with the outcome. In a patient with an abnormality in the right precuneus we observed an aberrant activation of the DMN network in response to a task. Characterization of the dysfunction of DMN in a patient with epilepsy in one of the key nodes of this network may help us to understand its role and relationship to IEDs.