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Decreased cerebral perfusion in the patients with idiopathic generalized epilepsy

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Background and Objective: Idiopathic generalized epilepsy (IGE) is characterized by typical absences, generalized tonic-clonic seizures (GTCS), or myoclonic jerks.¹ To elucidate the pathophysiology of IGE, numerous imaging studies have been performed. It has been traditionally believed that there is no radiological abnormality in patients with IGE. **However, a single photon emission computed tomography (SPECT) study during 3Hz spike and wave complexes in childhood absence epilepsy patients showed an overall increase in the cerebral blood flow (CBF), with significantly higher values being observed as compared to the baseline data.² This finding is supportive of the concept of a subcortical origin for the absence seizures. Yet, no interictal SPECT study has been performed in IGE patients with GTCS or myoclonic seizures. This study aimed to investigate the relative difference between CBF of 17 patients with IGE and 17 sex- and age-matched normal controls.**

Methods: Interictal ^{99m}Tc-ethylcysteinate dimer brain SPECT was performed before drug treatment in 17 patients with IGE (Male : Female = 7 : 10, 21.3 ± 4.5 years) and normal controls. Patients had no radiological abnormalities in their MRI scans. Included epilepsy syndromes were GTCS on awakening in 7 and juvenile myoclonic epilepsy in 10 patients. For SPM analysis, all SPECT images were spatially normalized to the standard SPECT template and then smoothed using a 12-mm full width at half-maximum Gaussian kernel. The student *t*-test was used to compare SPECT images between patients and normal controls.

Results: SPM analysis of brain SPECT images showed decreased perfusion in cingulate, bilateral thalami, right superior colliculus, cerebellum, left superior frontal region in the patients with idiopathic generalized epilepsy compared to normal controls at the uncorrected $p < .005$. No brain region showed increased perfusion compared to normal controls.

Discussion and Conclusion: In this study, we recruited patients with GTCS with or without myoclonic seizures and excluded those who have brain lesions on MRI or focal epileptiform discharges, in order to avoid the effect of any underlying focal abnormality of partial epilepsy on the cerebral blood flow. The reduced rCBF in the cingulate gyrus and thalamus suggests the functional disruption of the network involved in the generalized seizures in the IGE patients. The decreased rCBF in the superior colliculi may imply that a brainstem dysfunction is involved in the generation of seizures in IGE patients. The reduced rCBF in the cerebellar vermis and bilateral cerebellar hemispheres observed in the IGE patients implies that the functional derangement of cerebellar inhibitory mechanism may contribute to the generation of generalized seizures. These results suggest that dysfunctions in the thalamus, cingulate gyrus, brainstem and cerebellum are associated with IGE.

References

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