

MORE ON THE TIMING AND MEANING OF FDG-PET ABNORMALITIES IN PARTIAL EPILEPSY

Low Incidence of Abnormal ^{18}F FDG-PET in Children with New-onset Partial Epilepsy: A Prospective Study

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OBJECTIVE: Patients with refractory partial epilepsy often exhibit regional hypometabolism. It is unknown whether the metabolic abnormalities are present at seizure onset or develop over time.

METHODS: The authors studied 40 children within 1 year of their third unprovoked partial seizure with EEG, magnetic resonance imaging (MRI), and [^{18}F]-fluorodeoxyglucose (^{18}F FDG)-positron emission tomography (PET) (mean age at seizure onset, 5.8 years; range, 0.9–11.9 years; mean epilepsy duration, 1.1 years; range, 0.3–2.3 years; mean number of seizures, 30; range, 3–200). The authors excluded children with abnormal structural MRI, except four with mesial temporal sclerosis and two with subtle hippocampal dysgenesis. ^{18}F FDG-PET was analyzed with a region-of-interest template. An absolute asymmetry index, $|AI|$, >0.15 was considered abnormal.

RESULTS: Thirty-three children had a presumptive temporal lobe focus, five frontotemporal, and two frontal. Mean AI for all regions was not different from that in 10 normal young adults, even when children less likely to have a temporal focus were excluded. Eight (20%) of 40 children had focal hypometabolism, all restricted to the temporal lobe, especially inferior mesial and inferior lateral regions. Abnormalities were ipsilateral to the presumed temporal lobe ictal focus.

CONCLUSIONS: Abnormalities of glucose utilization may be less common and profound in children with new-onset partial seizures than in adults with chronic partial epilepsy. Although these patients' prognosis is uncertain, resolution of epilepsy after three documented seizures is uncommon. If the subjects develop a higher incidence of

hypometabolism in the future with planned follow-up studies, metabolic dysfunction may be related to persistent epilepsy rather than present at seizure onset.

COMMENTARY

Eighty to ninety percent of fluorodeoxyglucose-positron emission tomography (FDG-PET) studies are abnormal in patients with medial temporal lobe epilepsy undergoing surgical evaluation. These scans most often reveal unilateral temporal lobe hypometabolism, with diminished FDG uptake in both medial and lateral temporal cortex. In addition, quantitative studies often show evidence for hypometabolism in other lobes of the brain and in subcortical structures, particularly the thalamus and caudate nucleus. FDG-PET scans are less often positive in the extratemporal epilepsies, although many have hypometabolism in the epileptogenic lobe. It is thought that the decrease in metabolism is mainly due to neuronal loss, although a functional depression of metabolism also has been found. There is evidence for reversal of contralateral temporal lobe hypometabolism after temporal lobectomy for epilepsy.

The findings in the present study raise the question as to whether the hypometabolism seen in refractory epilepsy represents a progressive functional derangement rather than a mainly static impairment consequent to cell loss. This might correspond to the clinical course often observed in patients with medial temporal lobe epilepsy, in which a benign early phase is succeeded by a "malignant" phase, characterized by uncontrolled seizures and progressive cognitive impairment. The long-term PET-FDG studies planned in the future for these individuals by the authors should answer this question. At present, the number of patients evaluated and the diversity of pathologic substrates do not permit a clear conclusion as to whether patients with intractable seizures develop temporal lobe hypometabolism as their illness matures. Caution also should be observed in interpreting these findings, because the long-term prognosis is not yet known for these patients; many could prove to have a benign course.

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