Presurgical Evaluation in Nonlesional Epilepsy: PET
Sunday December 8, 2013

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## Disclosure

<table>
<thead>
<tr>
<th>Name of Commercial Interest</th>
<th>Type of Financial Relationship</th>
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<tbody>
<tr>
<td>Janssen-Cilag, Sanofi-Aventis, GSK, UCB Pharma, Scigen, Eisai, Velacor</td>
<td>Research funding, advisory boards, speaker honorariums</td>
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Learning Objectives

• Understand the role of FDG-PET in the evaluation of non-lesional epilepsy.
Interictal FDG-PET

• Focal hypometabolism in 80-95% of drug resistant temporal lobe epilepsy cases.
  • Few false lateralising cases.
• Lower localisation rate in extra-temporal epilepsy (30-67%).
• Predictive of outcome following epilepsy surgery.


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### Localising value of FDG-PET in non-lesional epilepsy

**PET Localising**

<table>
<thead>
<tr>
<th>Region</th>
<th>PET Localising</th>
<th>MRI Non-localising</th>
<th>PET Localising &amp; MRI Non-localising</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporal (n=117)</td>
<td>103 (88%)</td>
<td>68 (58%)</td>
<td>59/68 (87%)</td>
</tr>
<tr>
<td>Extratemporal/Unlocalised (n=59)</td>
<td>29 (49%)</td>
<td>44 (75%)</td>
<td>21/44 (48%)</td>
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*O’Brien et al., J Nuc Med 2008*
FDG-PET: Predictive of post-surgical outcome in patients with non-lesional MRI

<table>
<thead>
<tr>
<th></th>
<th>Class I/II outcomes</th>
<th>Class III/IV outcomes</th>
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<tbody>
<tr>
<td><strong>PET localising</strong></td>
<td>24 (80%)</td>
<td>6 (20%)</td>
</tr>
<tr>
<td><strong>PET non-localising</strong></td>
<td>1 (25%)</td>
<td>3 (75%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>25 (74%)</td>
<td>9 (26%)</td>
</tr>
</tbody>
</table>

O’Brien et al., J Nuc Med 2008;
MRI Negative, FDG-PET positive TLE:

Surgical outcome in PET-positive, MRI-negative patients with temporal lobe epilepsy

*Carla LoPinto-Khoury, *Michael R. Sperling, *Christopher Skidmore, *Maromi Nei, †James Evans, †Ashwini Sharan, and *Scott Mintzer

Departments of *Neurology and †Neurosurgery, Thomas Jefferson University, Philadelphia, Pennsylvania, U.S.A.
FDG-PET with “non-lesional” MRI: A guide where to look
FDG-PET with “non-lesional” MRI: A guide where to implant

FDG-PET improves surgical outcome in negative MRI Taylor-type focal cortical dysplasias

**ABSTRACT**

**Objective:** To determine the diagnostic accuracy and prognostic value of $^{18}$FDG-PET in a recent series of patients operated for intractable partial epilepsy associated with histologically proven Taylor-type focal cortical dysplasia (TTFCD) and negative MRI.

**Methods:** Of 23 consecutive patients (12 male, 7–38 years old) with negative 1.5-Tesla MRI, 10 exhibited subtle nonspecific abnormalities (e.g., unusual sulcus depth or gyral pattern) and the 13 others had strictly normal MRI. FDG-PET was analyzed both visually after coregistration on MRI and using SPM5 software. Metabolic data were compared with the epileptogenic zone (EZ) determined by stereo-EEG (SEEG) and surgical outcome.

**Results:** Visual PET analysis disclosed a focal or regional hypometabolism in 18 cases (78%) corresponding to a single gyrus ($n = 9$) or a larger cortical region ($n = 9$). PET/MRI coregistration detected a partially hypometabolic gyrus in 4 additional cases. SPM5 PET analysis ($n = 18$) was concordant with visual analysis in 13 cases. Location of PET abnormalities was extratemporal in all cases, involving eloquent cortex in 15 (65%). Correlations between SEEG, PET/MRI, and histologic findings ($n = 20$) demonstrated that single hypometabolic gyrus ($n = 11$) corresponded to EZ and TTFCD, which was localized at the bottom of the sulcus. Larger hypometabolic areas ($n = 9$) also included the EZ and the dysplastic cortex but were more extensive. Following limited cortical resection (mean follow-up 4 years), seizure freedom without permanent motor deficit was obtained in 20/23 patients (87%).

**Conclusions:** $^{18}$FDG-PET coregistered with MRI is highly sensitive to detect TTFCD and greatly improves diagnosis and surgical prognosis of patients with negative MRI. *Neurology* 2010;75:2169–2175

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Impact on Clinical Care and Practice

- FDG-PET can localize the epileptogenic zone in patients with drug resistant focal epilepsy.
- Higher sensitivity in TLE vs. ETLE
- Predictive of outcome with respect to seizures
- A guide “where to look” for subtle MRI lesions, and “where to implant” in truly non-lesional cases.