Clinical Area: **FDG PET for presurgical evaluation for refractory seizures**
Keywords: **FDG PET, EEG, MRI, temporal lobe epilepsy**
Reference: **Knowlton RC, Lazer KD, Ende G, Hawkins RA, Wong STC, Matson GB et al. Presurgical multimodality neuroimaging in electroencephalographic lateralized temporal lobe epilepsy. Ann Neurol 1997; 42: 829-37.**

Study Type: Comparison of diagnostic tests
Study Aim: To compare FDG PET and other imaging techniques in the presurgical evaluation of patients with nonlesional EEG-defined unilateral temporal lobe epilepsy (TLE).

Outcomes

- *Primary:* Proportion of patients lateralized.
- *Secondary:* Sensitivity.

Design

- *Number of subjects:* N=25
- *Description of study population:* 12 males/13 females; mean age=38 (range, 14-56).
- Inclusion: Nonlesional unilateral temporal lobe epilepsy (TLE). Exclusion: FDG PET data uninterpretable, not completing protocol examinations.
- *Procedure:* Patients received the following imaging modalities (not all patients received all of these): FDG-PET, Diagnostic MRI, Proton magnetic resonance spectrocopic imaging (H-MRSI), Hippocampal volumetry (HV), T2 relaxomatry. Patients received temporal lobectomy. Resection of the anterior-medial temporal lobe, including the amygdala and hippocampus, was performed in 24 patients. Mean length of follow-up was 23 months, range=18-31 months (for the 24 patients with surgery).

Validity

- *Independent blind comparison with a gold standard or follow-up of those not receiving the gold standard test?* PET images were interpreted by two interpreters blinded to clinical and EEG data. Diagnostic MRI scans were read by a neuroradiologist blinded to clinical, EEG and other imaging data. Gold standard not specified and is unclear.
- *Was "normal" defined?* No.
- *Appropriate spectrum of disease?* Yes.
- *Consecutive patients?* Yes, with the exception of those who did not complete the required tests. (i.e. consecutive patients were screened for inclusion, 3 were excluded for not completing examinations).
- *Methods described in enough detail to enable you to replicate the test?* Yes.
- *Reproducible results?* Yes.

Conclusions regarding validity of methods:
This study had a small sample size and not all patients received all of the tests. A gold standard for interpreting the accuracy of PET (e.g. invasive EEG) was not specified. The study would have been stronger if more patients were included and a protocol was followed up more closely.

Results
23 patients had FDG PET.
All 25 patients had diagnostic MRI and hippocampal volumetry.

FDG PET results were quantified. The authors stated that because of the subjective nature of determining relative hypometabolism, several asymmetry thresholds were evaluated. The threshold that produced the best sensitivity was selected.

Comparison of lateralization (n=23)

	Concordant	Discordant	Non-lateralized
FDG-PET			
Asymmetry score ≥3	20	0	3
HV			
AI ≥ 8%	15	0	8
H-MRSI (AI ≥ 8%)			
method #1	14	1	8
method #2	15	1	7

AI=asymmetry index

Sensitivity (gold standard unclear)

FDG-PET	87%
HV	65%
H-MRSI	
method #1	61%
method #2	57%
Combined HV and H-MRSI	83%

Correlation with outcome (seizure-free at follow-up, n=24)

For HV and FDG-PET, lateralization correlated significantly with seizure-free status ($p<0.0001$ and $p=0.04$, respectively).

Lateralized H-MRSI did not correlate with outcome

Authors' Conclusions
"Despite some limitations, our results do provide data for recommendations regarding the selective use of FDG-PET in presurgical evaluation of patients with EEG-defined temporal lobe epilepsy. For patients without hippocampal atrophy, PET provides essentially no new lateralization or outcome information."

Reviewer's Conclusions
This study suggests that FDG PET may be a sensitive technique for lateralizing patients with temporal lobe epilepsy. Other techniques (e.g. the combination of HV and H-MRSI) may be as sensitive as FDG PET. Findings need to be replicated in larger, well-done studies with a clearly defined gold standard.