Manuscript title: Teaching NeuroImages: Increasing SPECTations for Ictal SPECT in Epilepsy Surgical Evaluation

Manuscript classification: Teaching NeuroImages – Resident & Fellow section.

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Case Description

We report a 15-year-old boy with chromosome 19p13.3 microdeletion, intellectual disability, colobomas, and drug-resistant epilepsy. He suffered near daily seizures characterized by eyelid fluttering, behavioral arrest, and unawareness with occasional progression to generalized tonic activity. Brain MRI showed diffuse white matter hyperintensities with a predilection for subcortical U-fibers. Video-EEG monitoring showed multifocal interictal discharges but a consistent ictal onset grossly in the left posterior temporal and occipital regions though with up to 10 seconds of electroclinical
delay. While brain PET was unremarkable, ictal SPECT (figures 1 and 2) revealed a discrete functional lesion in the left ventral occipital cortex. Here, ictal SPECT delineated the three-dimensional borders of the seizure onset zone in the deep occipital cortex. This information can be used to further refine the epileptogenic zone (EZ) in a targeted stereo-EEG investigation to optimize surgical outcome [1] and decrease SUDEP risk [2].

Ictal SPECT may assist lateralization, and even localization, of the EZ in patients with occipital lobe epilepsy [3,4]; MRI co-registration and early injection may further increase its yield.

**Appendix 1. Authors**

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<thead>
<tr>
<th>Name</th>
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Teaching Slides - http://links.lww.com/WNL/B386

References


Figure legend

Figure 1: Ictal EEG. Sensitivity 10 uV/mm, LF 1 Hz, HF 70 Hz, notch off.

Bipolar (A) and average reference (B) showing initial eyelid fluttering artifact (red arrows) followed by 50 uV, 10-12 Hz rhythmic activity at T5 and O1 (vertical red line and blue arrows). 99mTc-ECD was injected 3-4 seconds (star) after first unequivocal ictal electrographic change.
Figure 2: Dual phase perfusion single-photon emission computed tomography (SPECT) with MRI co-registration. (A and B) Shows a focus of hyperperfusion (red arrows) within the left ventral occipital cortex using fused subtraction SPECT-SPACE FLAIR MR images. (A) is adjusted to show differences with Z-scores>2.5; (B) shows all differences. (C and D) shows interictal and ictal phases of 99mTc-ECD perfusion SPECT, respectively.
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