Teaching NeurolImage: Increasing SPECTations for Ictal SPECT in Epilepsy Surgical Evaluation

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Figure 1 Ictal EEG

Sensitivity 10 µV/mm, low-frequency filter 1 Hz, high-frequency filter 70 Hz, notch off. (A) Bipolar and (B) average reference showing initial eyelid fluttering artifact (red arrows) followed by 50 µV, 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.

We report a 15-year-old boy with chromosome 19p13.3 microdeletion, intellectual disability, colobomas, and drug-resistant epilepsy. He had 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 but with up to 10 seconds of electroclinical delay. Brain PET was unremarkable, but ictal SPECT (figures 1 and 2) revealed a discrete functional lesion in the left ventral occipital cortex. Here, ictal SPECT delineated the 3D

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Figure 2 Dual Phase Perfusion SPECT With MRI Coregistration

(A, B) A focus of hyperperfusion (red arrows) within the left ventral occipital cortex using fused subtraction SPECT-SPACE fluid-attenuated inversion recovery MRI. (A) Adjusted to show differences with Z scores >2.5; (B) shows all differences. (C, D) Interictal and ictal phases of ^{99m}Tc-ECD perfusion SPECT, respectively.

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 outcome¹ 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 coregistration and early injection may further increase its yield.

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Disclosure

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Name	Location	Contribution
Fábio A. Nascimento, MD	Massachusetts General Hospital, Boston	Study concept and design, data analysis and interpretation, drafting manuscript

Appendix (continued)

Name	Location	Contribution
Rory L. Cochran, MD, PhD	Massachusetts General Hospital, Boston	Data analysis and interpretation, drafting manuscript
David Z. Chow, MD	Massachusetts General Hospital, Boston	Data analysis and interpretation, revising manuscript
James A. Scott, MD	Massachusetts General Hospital, Boston	Data analysis and interpretation, revising manuscript
Catherine J. Chu, MD	Massachusetts General Hospital, Boston	Data analysis and interpretation, revising manuscript, final approval

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