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Lateralizing and Localizing Findings in Focal Epilepsies: A Concise Review

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Abstract

Knowledge of lateralizing and localizing value of seizure semiology and other clinical findings is necessary in the management process of patients with focal epilepsy, particularly with widespread use of surgery in the management of patients with refractory focal epilepsy. The advent of video-EEG monitoring has permitted careful analysis of semiologic features of seizures and their correlation with simultaneous EEG activities. The availability of new imaging and functional studies could be considered as a revolution in localization of the epileptogenic zone. In the current concise review, a list of well-documented lateralizing and localizing findings in focal epilepsies is prepared. This paper is designed as a practical tool for physicians, aiming to serve as a practical, problem-oriented reference. While I include the correlated symptomatogenic zone and the possible mechanism in generating the finding in the context of a focal seizure, this paper emphasizes how to localize the epileptogenic zone according to any given specific finding. I hope that this paper leads to improved patient care.

Keywords: EEG; Focal epilepsy; Lateralization; MRI; Semiology

Introduction

Knowledge of lateralizing and localizing value of seizure semiology (symptoms and signs) and other clinical findings is not only helpful, but also necessary in the management process of patients with focal epilepsy. The importance of these findings has specifically increased during the past three decades and with widespread use of surgery in the management of patients with refractory focal epilepsy. The advent of video-EEG monitoring has permitted careful analysis of semiologic features of seizures and their correlation with simultaneous EEG activities. The availability of new imaging and functional studies could be considered as a revolution in localization of the epileptogenic zone in patients with focal epilepsy [1].

One should consider that seizure semiology has several limitations in localizing and even lateralizing the seizure onset. Although, many semiologic features have high positive predictive values, none is perfect in determining the seizure onset or epileptogenic zones. Seizure semiology is sometimes dictated by the pathway of electrical seizure propagation [2] and can reflect only the symptomatogenic zone [3]. Therefore, video recordings of multiple seizures should be reviewed carefully to find as many useful semiologic features as possible. A seizure that is representative of the rest of the recorded seizures should be reviewed with the patient's relatives to verify that habitual seizures have been captured and analyzed. It is noteworthy to mention that age and brain maturation has some effects on seizure semiology and ictal features are less conclusive in children with focal epilepsy [4]. Concordance between seizure semiology and EEG activity increases the value of localization process and judgment [2,5]. Furthermore, concordance of the above-mentioned findings with imaging, functional studies, and neuropsychological studies increase the reliability of the localization and / or lateralization of the seizure onset zone or epileptogenic zone significantly [6-10].

In the current concise review, a list of presumably well-documented lateralizing and localizing findings in focal epilepsies is prepared (Tables 1-6). The purpose is to provide a complete and easy to use list of clinical findings, which are helpful in lateralization and localization of the epileptogenic zone in patients with focal epilepsy. This paper is designed as a practical tool for physicians, aiming to serve as a practical, problem-oriented reference. While, I include the correlated symptomatogenic zone and the possible mechanism in generating the finding in the context of a focal seizure, this paper emphasizes how to localize the epileptogenic zone according to any given specific finding. These findings are organized in a series of tables (Tables 1-6). These tables are organized in a way, so that the reader can easily review the relevant information. I hope that this concise paper leads to improved patient care.

References

1. Fogarasi A, Janszky J, Tuxhorn I (2006) Peri-ictal lateralizing signs in children: blinded multiobserver study of 100 children below 12 years. Neurology 66: 271-274.

2. So EL (2006) Value and limitations of seizure semiology in localizing seizure onset. J Clin Neurophysiol 23: 353-357.

3. Loddenkemper T, Kotagal P (2005) Lateralizing signs during seizures in focal epilepsy. Epil Behav 7: 1-17.

4. Fogarasi A, Jokeit H, Faveret E, Janszky J, Tuxhorn I (2002) The effect of age on seizure semiology in childhood temporal lobe epilepsy. Epilepsia 43: 638-643.

5. Serles W, Caramanos Z, Lindinger G, Pataria E, Baumgartner C (2000) Combining ictal surface-electroencephalography and seizure semiology improves patient lateralization in temporal lobe epilepsy. Epilepsia 41: 1567-1573.

6. Kuzniecky RI (2005) Neuroimaging of epilepsy: Therapeutic implications. NeuroRx 2: 384-393.

7. Alpherts WCJ, Vermeulen J, van Veelen CW (2000) The Wada test: prediction

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Semiology	Lateralizing value (PPV)	Symptomatogenic zone	Mechanism
Homonymous hemifield visual aura or defect	100%	Brodmann areas 17-19	Activation
Unilateral ictal paresis or immobile limb	100%	Negative motor areas	Activation
Forced head version less than 10 second before secondary generalization	> 90%	Brodmann areas 6 & 8 (frontal eye and motor areas)	Activation
Unilateral ictal dystonia	> 90%	Spread from seizure onset zone to ipsilateral basal ganglia	Activation
Postictal (Todd's) palsy	> 90%	Brodmann areas 4 & 6 (primary motor area)	Exhaustion/ Inhibition
Fencing posture	90%	SMA	Activation
Figure-of-4 sign (Asymmetric tonic limb posturing)	~ 90%	SMA/ Prefrontal area	Activation
Unilateral tonic activity	~ 90%	SMA/Brodmann area 6	Activation
Unilateral sensory or painful aura	~ 90%	Brodmann areas 1, 2, 3 (primary SSA)	Activation
Unilateral clonic activity	> 80%	Brodmann areas 4 & 6 (primary motor area)	Activation
Emotional facial asymmetry	> 80%	Unknown	Unknown
Epileptic nystagmus	N/A	Posterior head regions	Unknown

PPV: Positive Predictive Value; SMA: Supplementary Motor Area; N/A: Not Assigned.

Table 1: Localizing semiologic findings pointing to the contralateral location (for the epileptogenic zone).

Semiology	Lateralizing value (PPV)	Symptomatogenic zone	Mechanism
Unilateral automatisms with contralateral dystonic posturing*	> 95%	N/A	Release phenomenon / Activation
Postictal nose wiping	> 90%*	Unknown	Unknown
Unilateral ictal eye blinking	> 80%	Unknown	Unknown
Ictal piloerection (goose bumps)*	> 80%	Unknown	Unknown
Last clonic jerk	> 80%	Brodmann areas 4 & 6 (primary motor area)	? Exhaustion of the hemisphere of onset

*In TLE.
PPV: Positive Predictive Value; TLE: Temporal Lobe Epilepsy; N/A: Not Assigned.

Table 2: Localizing semiologic findings pointing to the ipsilateral location (for the epileptogenic zone).

Semiology	Lateralizing value (PPV)	Symptomatogenic zone	Mechanism
Preserved consciousness and automatisms*	100%	Unknown	Unknown
Ictal speech preservation*	> 80%	N/A	Impairment of non-language areas
Ictal vomiting*	> 80%	Temporal lobe and Papez circuit	Activation
Ictal spitting*	75%	Unknown	Unknown
Ictal urinary urge	N/A	Mesial frontal region/ Medial temporal gyrus	Activation
Orgasmic auras	N/A	Mesiotemporal / frontal / amygdala	Activation
Peri-ictal water drinking*	N/A	Lateral hypothalamus	Activation

*in TLE.
PPV: Positive Predictive Value; TLE: Temporal Lobe Epilepsy; N/A: Not Assigned.

Table 3: Lateralizing semiologic findings pointing to the non-dominant hemisphere.

Semiology	Lateralizing value (PPV)	Symptomatogenic zone	Mechanism
Ictal speech arrest*	67%	language areas	Impairment of language areas
Postictal dysphasia	> 80%	language areas	Impairment of language areas

*in TLE.
PPV: Positive Predictive Value; TLE: Temporal Lobe Epilepsy

Table 4: Lateralizing semiologic findings pointing to the dominant hemisphere.

Semiology	Symptomatogenic zone	Mechanism
Auditory auras	Superior temporal gyrus	Activation
Ictal vocalization	Broca's area	Activation
Postictal Cough	N/A	N/A
Gelastic Seizure	Hypothalamus	N/A
Olfactory and Gustatory auras	Temporal lobe structures	Activation

N/A: not assigned.

Table 5: Non-lateralizing semiologic findings in focal epilepsies.

Finding	Lateralizing value (PPV)	Mechanism
Interictal EEG in TLE	75%	Activation
Ictal EEG in TLE	80-92%	Activation
Ictal EEG + Semiology in TLE	95%	_____
Interictal EEG in ETE	50-66%	Activation
Ictal EEG in ETE	Variable	Activation
CT scan abnormality	Variable	Lesion
MRI abnormality	86-100%	Lesion
Interictal PET abnormality	~ 90%	Hypometabolism
Ictal SPECT abnormality	> 95%	Hyperperfusion
Interictal SPECT abnormality	> 80%	Hypoperfusion
Wada test in TLE**	85%	Memory asymmetry

*Depends on the type of EEG recording. **Only in TLE.
PPV: Positive Predictive Value; TLE: Temporal Lobe Epilepsy; ETE: Extratemporal Epilepsy; EEG: Electroencephalography; CT: Computed Tomography; MRI: Magnetic Resonance Imaging; PET: Positron Emission Tomography; SPECT: Single Photon Emission Computed Tomography

Table 6: Lateralizing and localizing paraclinical findings in focal epilepsies.

of focus lateralization by asymmetric and symmetric recall. Epilepsy Res 39: 239-249.

8. Kim YK, Lee DS, Lee SK, Kim SK, Chung CK, et al. (2003) Differential features of metabolic abnormalities between medial and lateral temporal lobe epilepsy: quantitative analysis of F-FDG PET using SPM. J Nuc Med 44: 1006-1012.
9. Moser DJ, Bauer RM, Gilmore RL, Dede DE, Fennell EB, et al. (2000) Electroencephalographic volumetric and neuropsychological indicators of seizure focus lateralization in temporal lobe epilepsy. Arch Neurol 75: 707-712.
10. Jan MMS, Girvin JP (2008) Seizure Semiology: Value in Identifying Seizure Origin. Can J Neurol Sci 35: 22-30.

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