

N3-2 A New Biomarker of Epileptogenicity in Severely



Damaged Brain ~A Preliminary Study of High Frequency Oscillations (HFOs) on EEG in the Severe Motor and Intellectual Disabilities (SMID)~

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HIGHLIGHTS

- 1) The number of electrodes with HFOs may reflect epileptogenicity.
- 2) The frequency of HFOs in SMID is lower than in Roland Epilepsy.

COI disclosure: The authors have no conflict of interest to disclose with respect to this presentation. Because the number of patients has increased (10→20), some data was different from the abstract.

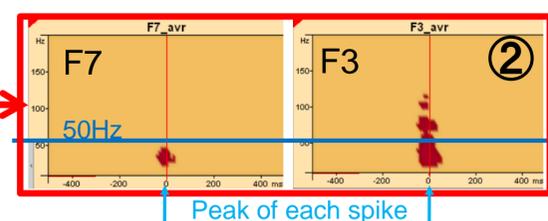
Background

Epilepsy in **Severe Motor and Intellectual Disabilities (SMID)** is often intractable and requires various drugs. Recently, **High Frequency Oscillations (HFOs)** on scalp EEG has been considered as the indicator for epileptogenicity, especially in idiopathic partial epilepsy¹). Here, we analyzed HFOs in SMID to devise **“Treatment Strategy” for intractable epilepsy.**

Methods

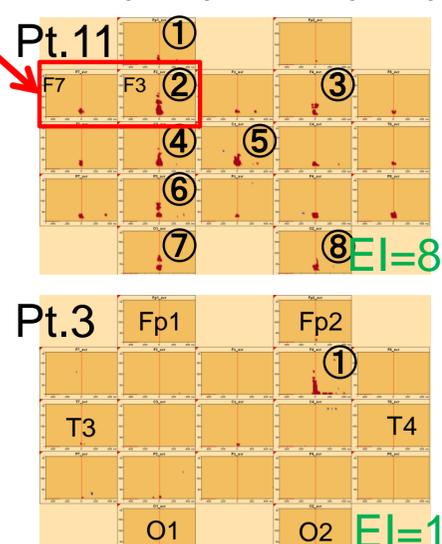
Scalp EEG of 20 SMID patients were examined using 1,000 Hz sampling rate and Time–Frequency analysis was performed (± 500 ms of each spike; 10-200 Hz; averaged 30 ± 3 spikes). “The number of electrodes with significant HFOs over 50 Hz” was defined as **“Epileptogenicity Index”(EI)** (Fig.1,2). EI was compared with the frequency of habitual seizures.

Figure 1: Example of HFOs



F7 shows no HFOs over 50 Hz, whereas F3 shows HFOs up to around 125 Hz. (Patient 11)

Figure 2: HFOs on scalp EEG Pt.11 (EI=8) vs Pt.3 (EI=1)



Results

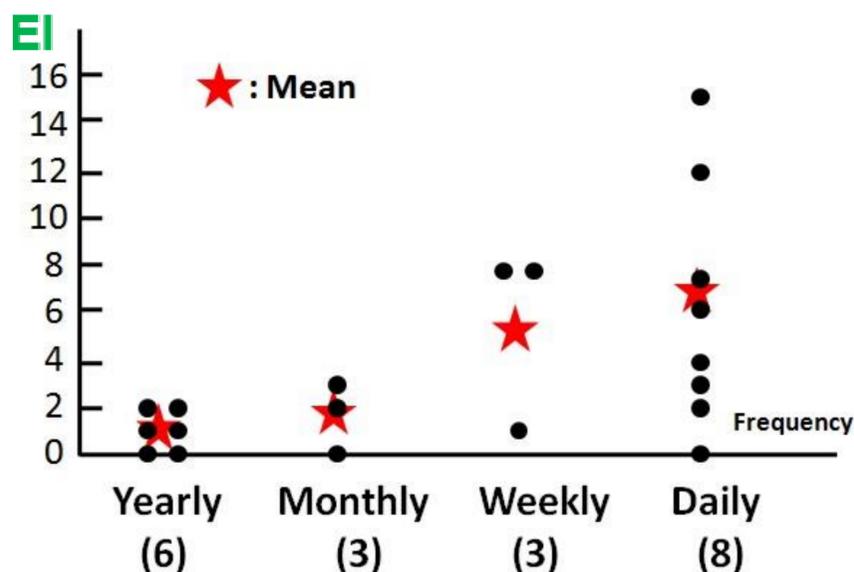
The patients profiles and their EI are shown in Table 1. The frequency of habitual seizures ranged from daily to yearly. **The EI had a correlation with frequency of seizures** (Fig. 3). The mean EI for yearly, monthly, weekly and daily were 1.0, 1.7, 5.7 and 6.1, respectively. Since the frequency of HFO in general is lower than previous study in Rolandic Epilepsy, **50 Hz could be cutoff value** to evaluate the epileptogenicity.

Table1 : The patients profiles and EI

Patient	Age	Sex	Frequency	EI
1	57	F	Yearly	0
2	41	M	Yearly	0
3	50	F	Yearly	1
4	65	F	Yearly	1
5	43	F	Yearly	2
6	35	F	Yearly	2
7	58	F	Monthly	0
8	15	F	Monthly	2
9	35	F	Monthly	3
10	40	F	Weekly	1
11	39	M	Weekly	8
12	33	F	Weekly	8
13	22	F	Daily	0
14	50	M	Daily	2
15	21	M	Daily	3
16	39	M	Daily	4
17	6	F	Daily	6
18	26	F	Daily	7
19	20	F	Daily	12
20	42	F	Daily	15

EI = “Epileptogenicity Index”

Figure 3: EI and Frequency of seizures



The average of EI was in proportion to the frequency of habitual seizures. There was no EI over 2 in “Yearly” whereas EI over 10 was recorded only in “Daily.”

Conclusions

To our best knowledge, this is **the first HFOs analysis in SMID**. Same as in the case of idiopathic partial epilepsy, this preliminary study suggests that **EI of patients with SMID may also reflect epileptogenicity** which can be used as a biomarker for treatment.

Reference 1) Kobayasi K., Yoshinaga H., Toda Y., et al. High-frequency oscillation in idiopathic partial epilepsy of childhood. *Epilepsia* 2011; 52: 1812-1819.