

# #1.047 The Decrease of “Scalp” High Frequency Oscillations (HFOs) along with Improvement of Epilepsy ~ A new Biomarker in Epilepsy Treatment ~



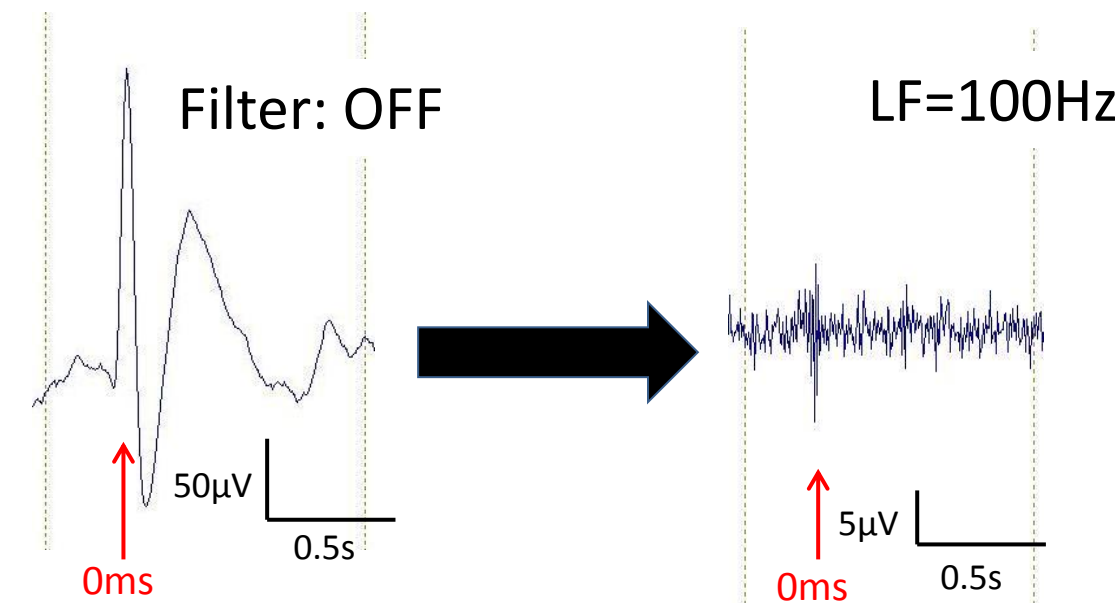
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## Rationale:

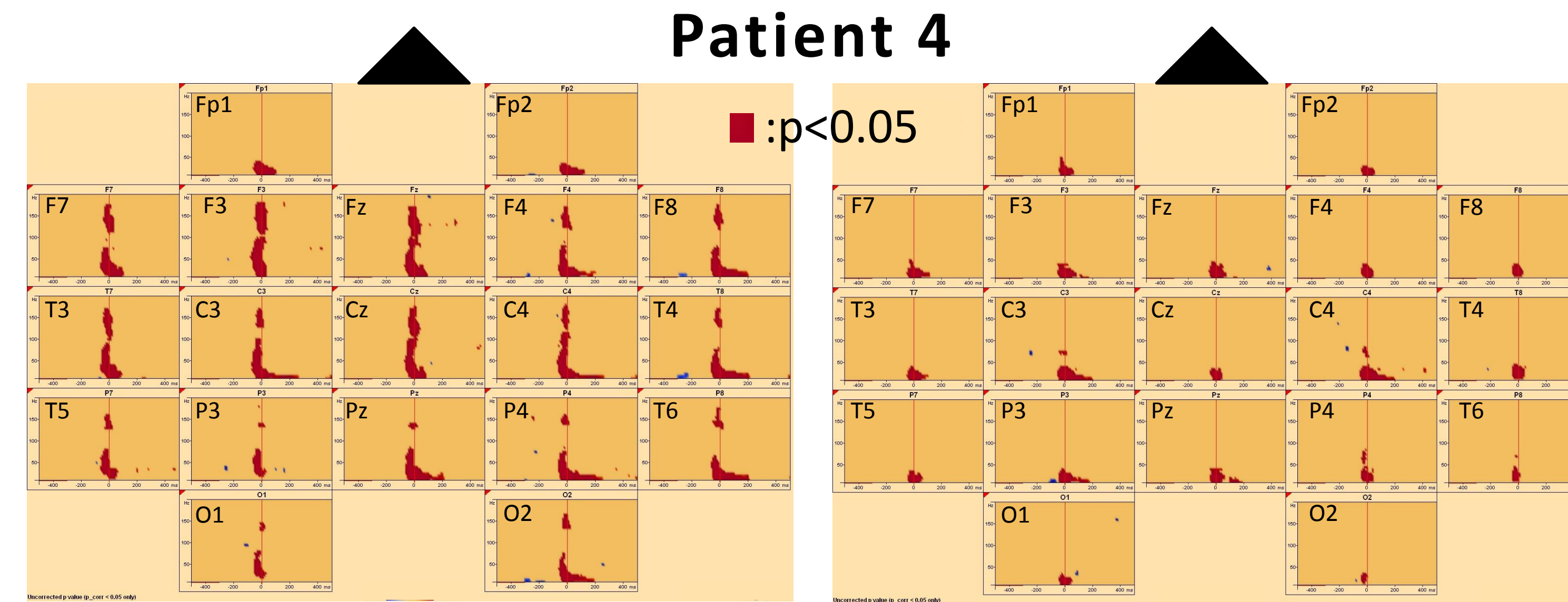
The utility of “scalp” High Frequency Oscillations (HFOs) has been reported and applied to various fields in epilepsy<sup>1</sup>). We also reported the usefulness of scalp HFOs as a predictor of prognosis in epilepsy<sup>2</sup>). Here, we focused on the relation between the extension of scalp HFOs and the control of epilepsy.

## Methods:

Five patients (Table 1) with focal epilepsy underwent yearly scalp EEG with 1,000 Hz sampling frequency for 2-5 years. HFOs coincident with focal spike were confirmed macroscopically (Figure 1) and analyzed by time-frequency analysis (10-200 Hz; +/-500ms of the spike; reference period on first 200ms) in all scalp electrodes. The number of electrodes which showed significantly ( $p < 0.05$ ) increased amplitude over 80 Hz was counted in each EEG.



**Figure 1:** HFOs were macroscopically confirmed by using Low-Cut Filter (LF) setting.



**Figure 2:** HFOs > 80Hz = 17 (at 8 y.o.) **Figure 3:** HFOs > 80Hz = 0 (at 10 y.o.)

## Results:

A total of 15 EEGs were analyzed and the number of electrodes with HFOs over 80 Hz decreased with the age in **ALL** patients (Table 1). The extension of such electrodes was broader at first EEG but settled into electrodes around the spike. In three patients, the number decreased dramatically from late teens to around zero and the period of the decrease was accorded with good control of seizures. For example, patient 4, who developed first nocturnal seizure at 4 years old (y.o.) with Rolandic discharges, repeated seizures monthly and his last seizure was at 9 y.o. which situated between 17 electrodes (Figure 2) at 8 y.o. and 0 electrode (Figure 3) at 10 y.o..

## Conclusion:

The number of HFOs may reflect epileptogenicity at the time of recording EEG and could be the indicator for treatment of epilepsy. The number and distribution of electrodes with significant HFOs is a candidate for “new biomarker” of epilepsy treatment.

**Table 1:** Profile and clinical data of six patients

Pt.	age	sex	Classi- fication	First Sz.	Last Sz.	No. of Elect.(HFO>80Hz)					
						6 y.o.	7	8	9	10	11
1.	9	M	ABE	5 y.o.	7 y.o.	13	5	ND	0	-	-
2.	10	M	BECT	6	8	ND	ND	16	5	-	-
3.	11	F	BECT	3	10	ND	8	3	ND	0	-
4.	12	M	ABE	4	9	ND	19	17	ND	0	0
5.	12	M	a-BECT	6	7	ND	ND	ND	19	ND	0

BECT: benign childhood epilepsy with centrotemporal spikes, a-BECT: atypical BECT, ABE: atypical benign epilepsy with Rolandic spikes, Elect.: electrodes ND: HFO not done

## References:

- Kobayashi K, et al. High-frequency oscillations in idiopathic partial epilepsy of childhood. *Epilepsia* 2011 ;52: 1812-1819.
- Nagasawa T, et al. Predictive indicator for prognosis of childhood epilepsy with Rolandic discharges using HFOs. *Journal of the Japan Epilepsy Society* 2014 ;32: 411.

COI: The authors have no conflict of interest to declare.