

# The relations between “Scalp” EEG and HFOs along with improvement of epilepsy ~New biomarker in epilepsy treatments

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COI disclosure: The authors have no conflict of interest to disclose with respect to this presentation.

## HIGHLIGHTS

- 1) “Scalp” EEG can be useful in analyzing HFOs over epilepsy patient.
- 2) Number of electrodes accompanied by HFOs may reflect epileptogenicity.
- 3) Decrease of electrodes with HFOs could be new biomarker in treatments.

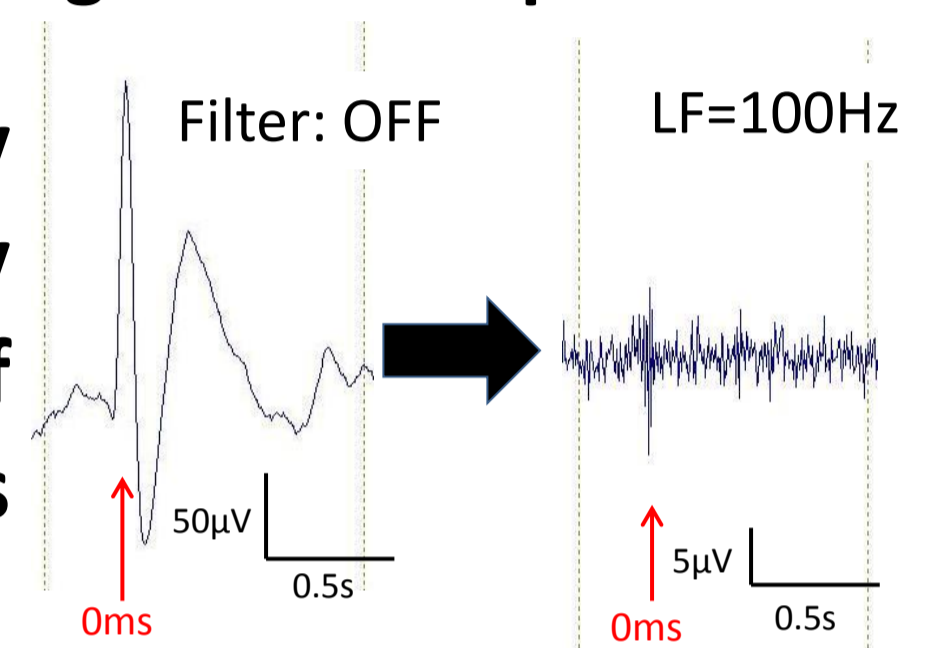
## Rationale

Recently, the utility of “scalp” HFOs has been reported. Here, we focused on the relations between the **scalp EEG** and **HFOs** for better control of epilepsy.

## Methods

Five young patients with focal epilepsy underwent yearly scalp EEG. **HFOs coincident with spikes** were analyzed by time-frequency analysis in **all electrodes**. The number of electrodes with significantly increased over 80 Hz was counted and compared with conventional scalp EEG.

Figure 1: Example HFOs



HFOs were macroscopically confirmed by using Low-Cut Filter (LF) setting.

## Results

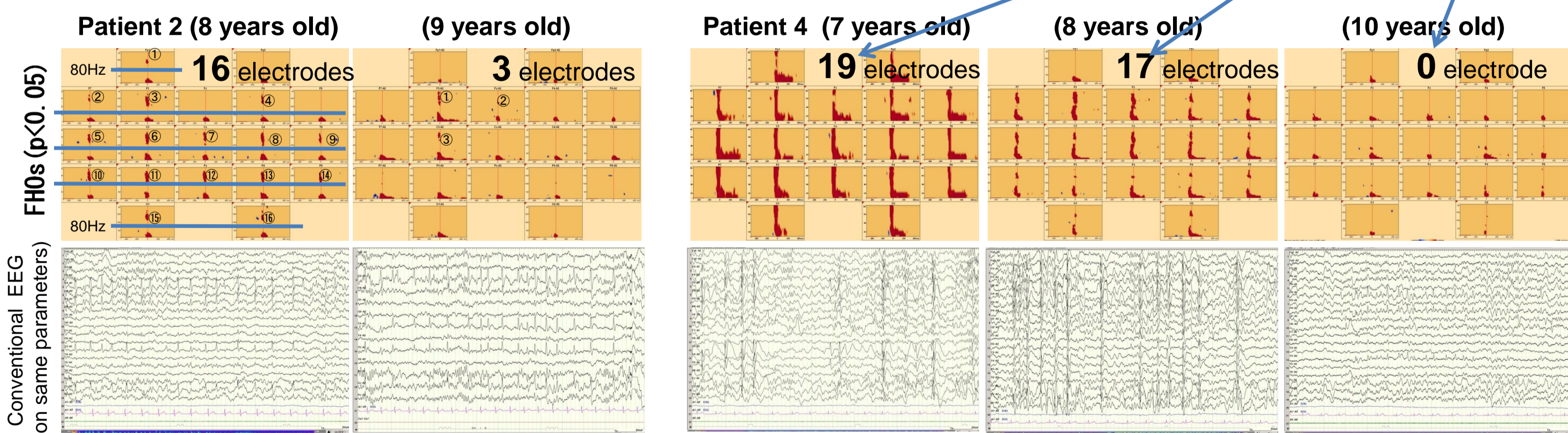
14 EEGs were analyzed and the number of electrodes with HFOs **decreased along with the age** in all patients.(Table) The frequency of spikes on EEG also decreased in patient 3, 4 and 5, but its rate was not dramatic as that of HFOs. The frequency of spikes did not change in other two patients (pt.1 and 2) even though the number of HFOs much decreased . (Fig. 2)

Table : Profile and clinical data of five 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.	16	3	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

Figure 2: The comparison between conventional EEG and HFOs



Patient 2 shows 16 electrodes with HFOs > 80Hz at 8 years old but only 3 electrodes at 9 years old, whereas the frequency of spikes on conventional EEG is similar. Patient 4 shows no electrode at 10 years old but there remains spikes on conventional EEG.

## Discussion

The number of HFOs **may reflect epileptogenicity** at the time of recording EEG and could be the indicator for treatment of epilepsy. In this study, the number of electrodes and distribution includes **more information than conventional scalp EEG**. The number of electrodes with significant HFOs is a candidate for **“new biomarker” of epilepsy treatment**.