May 9, 2025

AMED (Japan Agency for Medical Research and Development) Supports

International Collaboration

Implementation of wide band EEG in epilepsy care by digital EEG

No.6

One point comment:

Special:

back to the basic, past, & future again!

Akio IKEDA, MD, PhD, FACNS
Department of Epilepsy, Movement Disorders & Physiology
Kyoto University Graduate School of Medicine
Kyoto, JAPAN

1

Disclosure Form

Company Name	Nature of Affiliation
• Sumitomo Pharma Co • Nihon-Kohden	• Industry-Academia Collaboration Courses • Collaboration study
• UCB Japan • Eli Lilly Japan • RICHO	• Collaboration study
Off-Label Product Usage	
• None	

2

Comments for last Zoom workshop on April 18, 2025 (No.5)

Seizure-onset patterns in focal cortical dysplasia and neurodevelopmental tumors: Relationship with surgical prognosis and neuropathologic subtypes

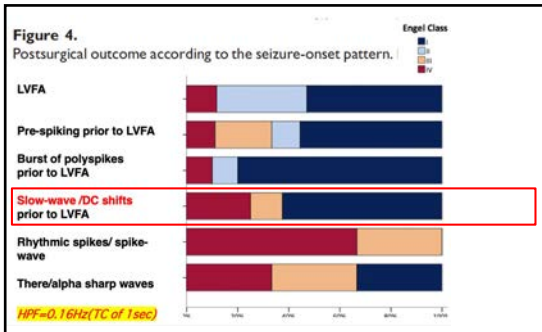
*†Stanislas Lagarde, *†Francesca Bonini, *†Aileen McGonigal, *†Patrick Chauvel, *†Martine Gavaret, ‡Didier Scavarda, †§Romain Carron, †§Jean Régis, *Sandrine Aubert, *Nathalie Villeneuve, †Bernard Giusiano, ¶Dominique Figarella-Branger, *†Agnès Trebuchon, and *†Fabrice Bartolomei

Epilepsia, 57(9):1426–1435, 2016

Results: We identified six seizure-onset patterns using visual and time-frequency analysis: low-voltage fast activity (LVFA); preictal spiking followed by LVFA; burst of polyspikes followed by LVFA; slow wave/DC shift followed by LVFA; theta/alpha sharp waves; and rhythmic spikes/spike-waves. We found a high prevalence of patterns that

Slow wave/DC shifts followed by LVFA

3



Slow wave/DC shifts prior to LVFA

⇩

Rather good, surgical outcome

4

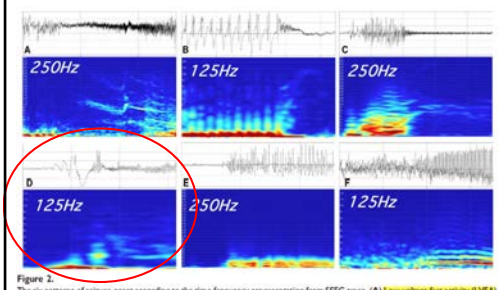
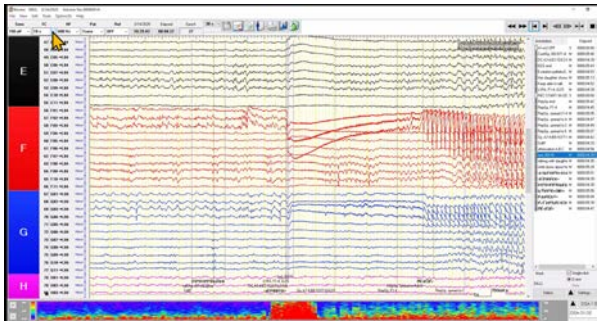


Figure 2.
The six patterns of seizure onset according to the time-frequency representation from SEEG trace. (A) Low-voltage fast activity (LVFA). (B) Preictal spiking with rhythmic spikes of low frequency followed by LVFA. (C) Burst of polyspikes of high frequency and amplitude followed by LVFA. (D) Slow wave or baseline shift followed by LVFA. (E) Rhythmic spikes or spike-waves, at low frequency and with high amplitude. (F) Theta/alpha sharp activity with progressive increasing amplitude.

Slow wave or baseline shifts followed by LVFA

5

Rapid development pattern



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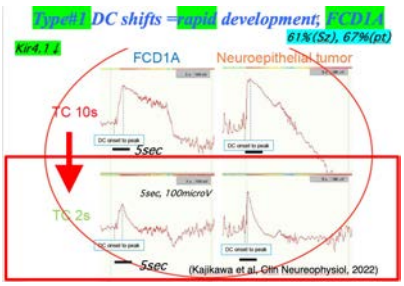
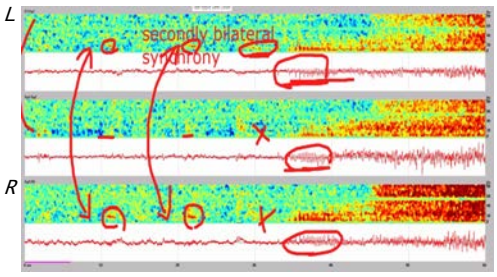


Rapid develop pattern of ictal DC shifts occurred in 61% of seizures and in 67 % of the patients.

7



Scalp EEG ictal pattern is good for HFO analysis, but may not be always for ictal DC shifts

8

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9

5th International Taiwanese Congress of Neurology (ITCN) 2025
11th East Asian Neurological Forum
2025 Annual meeting of Taiwan Neurological Society

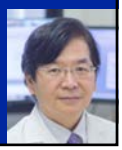
April 25-27th, 2025
Taipei International Convention Center, Taipei

Epilepsy

Clinical Infraslow EEG for many neurological disorders:

a window of astrocyte and mysterious magic of K homeostasis

Akio IKEDA, MD, PhD, FACNS
Department of Epilepsy, Movement Disorders & Physiology
Kyoto University Graduate School of Medicine
Kyoto, JAPAN

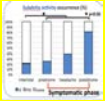


10

TC of 2sec scalp EEG could open the window for diagnosis, genenator mechanisms, and treatment in neurological disorders besides epilepsy

1) *Epilepsy*
Active DC shifts, Kir4.5, tripartite synapse, *CSD* Cortical spreading depolarization

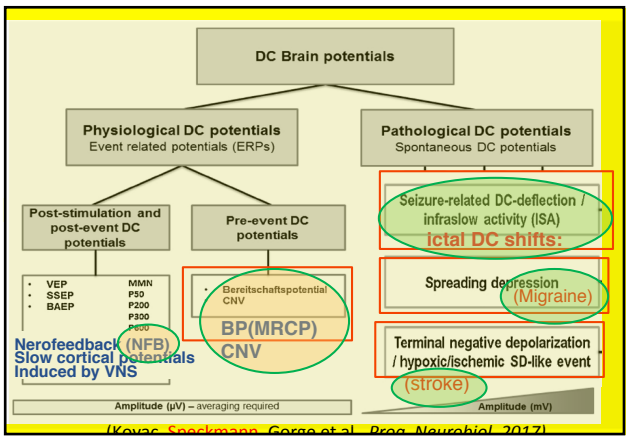
2) *Migraine aura is similar to epileptic aura in semiology involving posterior hemisphere*
delta slow, subdelta slow (1Hz >), occipital (30%)
(Hosokawa et al., Clin Neurophysiol, 2024)



3) *Cerebrovascular disease, Dementia*
transient focal neurological episode (*TFNEs*), infraslow activity (0.3Hz >)
Amyloid spell in cerebral amyloid angiopathy (*CAA*)

4) *Critical care, Head trauma*
Burst suppression with SISA(short infraslow activity) (Tougo et al, 2022)
Moyamoya disease (Hayashi et al., 2025, in press)

11



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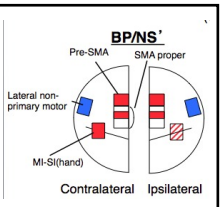
Brain (1992), 115-1017-1043

MOVEMENT-RELATED POTENTIALS RECORDED FROM SUPPLEMENTARY MOTOR AREA AND PRIMARY MOTOR AREA

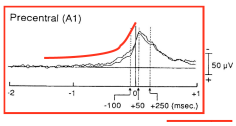
ROLE OF SUPPLEMENTARY MOTOR AREA IN VOLUNTARY MOVEMENTS

by AKIO IKEDA,[1,2,3] HANS O. LÜDERS,[1] RICHARD C. BURGESS[1] and HIROSHI SHIBASAKI[3]

(From the [1]Section of Epilepsy and Clinical Neurophysiology, Department of Neurology, The Cleveland Clinic Foundation, Ohio, USA, the [2]Division of Neurology, Department of Internal Medicine, Saga Medical School, Saga and the [3]Department of Brain Pathophysiology, Kyoto University School of Medicine, Kyoto, Japan)



Central motor control study of ACTION



Readiness potentials
Bereitschaftspotentials
before voluntary movement onset

13

Clinical Neurophysiology 170 (2025) 182–191

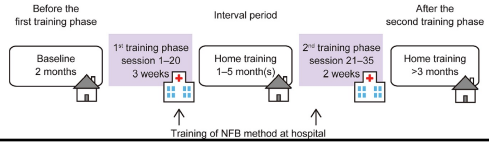
Contents lists available at ScienceDirect

Clinical Neurophysiology

Self-regulation of slow cortical potential and seizure suppression by scalp electroencephalography: Early prediction of therapeutic efficacy

Tomoyuki Fumuro[a,b], Masao Matsuhashi[a], Masako Kinoshita[c], Riki Matsumoto[d,e], Ryosuke Takahashi[c], Akio Ikeda[a,*]

Conclusions: Patients who acquired NFB control within a short period, i.e., 3 weeks, were more likely to exhibit a lower post-training seizure frequency.
Significance: SCP self-regulation can be acquired within a short period and is associated with seizure reduction.



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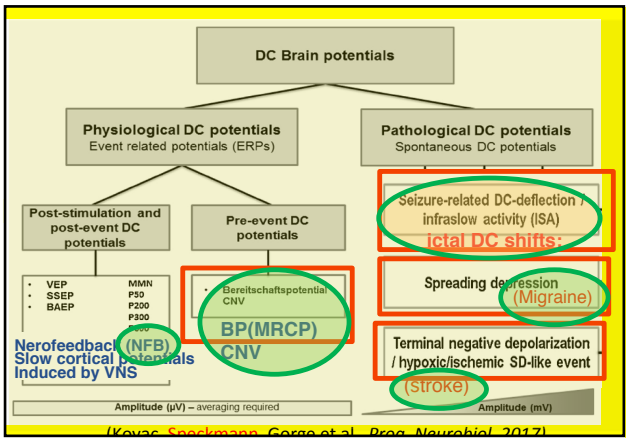

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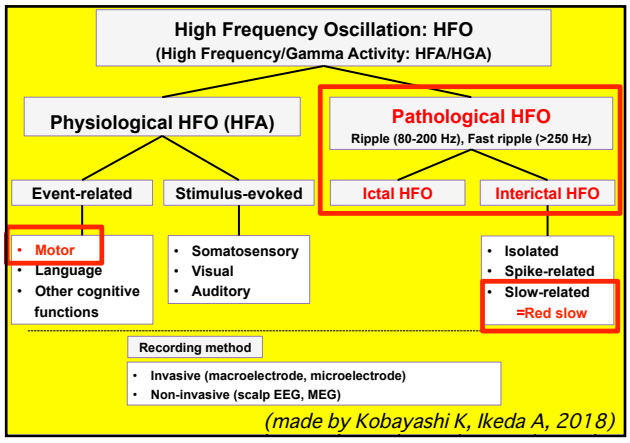

18

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Cortical spreading depolarization

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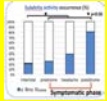

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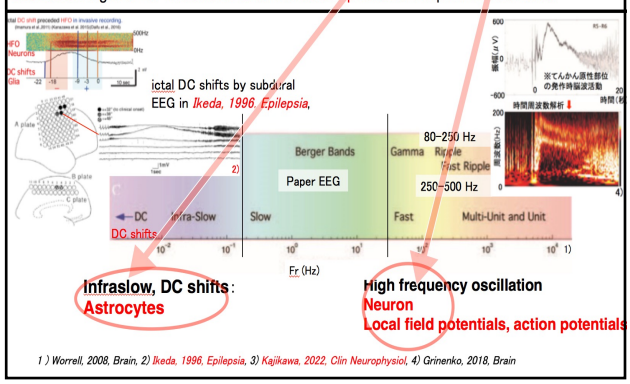
Amyloid spell in cerebral amyloid angiopathy (*CAA*)

4) *Critical care, Head trauma*
Burst suppression with SISA(short infraslow activity) (Tougo et al, 2022)
Moyamoya disease (Hayashi et al., 2025, in press)

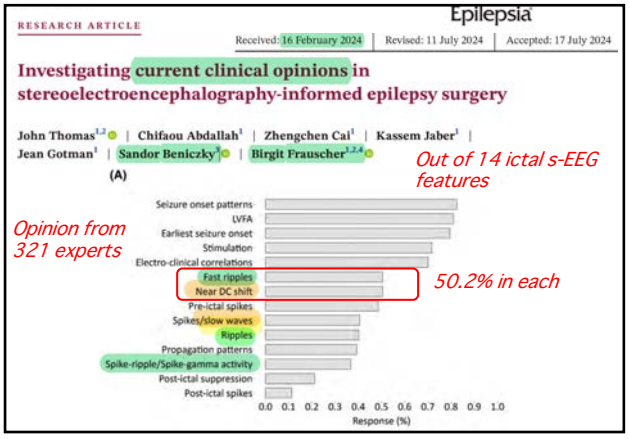
19

Digital wide-band EEG could provide us with both *infralow/ DC shifts* and *high frequency oscillation* together for invasive EEG as well as scalp EEG as the potential biomarker



1) Worrell, 2008, Brain, 2) Ikeda, 1996, Epilepsia, 3) Kajikawa, 2022, Clin Neurophysiol, 4) Grinenko, 2018, Brain

20



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Wide-band EEG: a mysterious and very useful technique

1) What is the wide-band EEG?
2) Special machine? Special technique?
3) Is it useful? Is it redundant? Just only research?
4) Useful only in invasive EEG?
5) Is it recorded by scalp-EEG?
6) EEG technologist could analyse?

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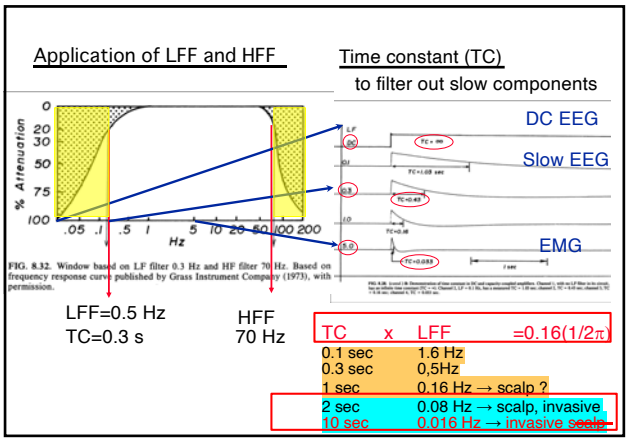

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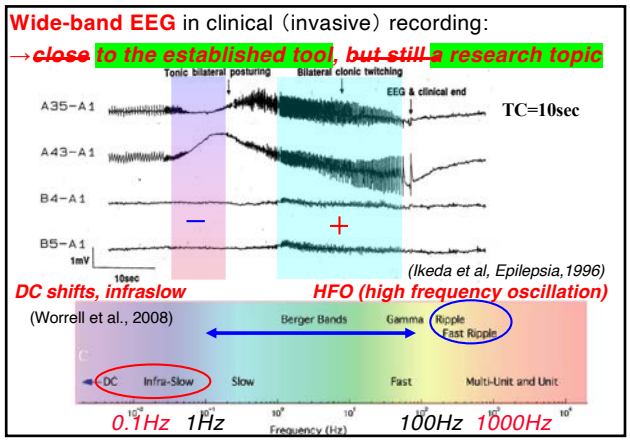

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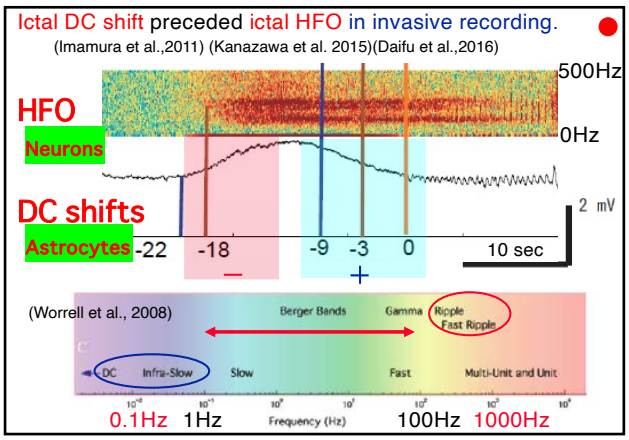

25

A comparison to epilepsy surgery outcome

	Retrospective study	Prospective study
Interictal HFO	• Jacobs J et al. Ann Neurol. 2010;67:209-220 • Akiyama T et al. Epilepsia 2011;52:1802-1811 • Van Klink NEC et al. Ann Neurol. 2017; 81: 664-676 others **Effective**	• Jacobs J et al. Neurology. 2018;91(11):e1040-e1052. 5 institutes • Zweiphenning W et al. Lancet Neurol. 2022; 21(11): 982–993 3 institutes **Non-effective**
Wide-band EEG (ictal DC shifts ictal HFO)	• Nakatani M et al. Brain Commun. 2022; 4(5) : fcac222. doi: 10.1093/braincomms/fcac222 5 institutes in Japan **Effective**	SDG(subdural grid) → SEEG **Not yet**

(a table made by Prof. T Maehara, Tokyo, Japan, 2024)

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A comparison to epilepsy surgery outcome

	Retrospective study	Prospective study
Interictal HFO	•Jacobs J et al. Ann Neurol. 2010;67:209-220 •Akiyama T et al. Epilepsia 2011;52:1802–1811 • Van Klink NEC et al. Ann Neurol. 2017; 81: 664-676 others **Effective**	•Jacobs J et al. Neurology. 2018;91(11):e1040-e1052. 5 institutes •Zweiphenning W et al. Lancet Neurol. 2022; 21(11): 982–993 3 institutes **Non-effective**
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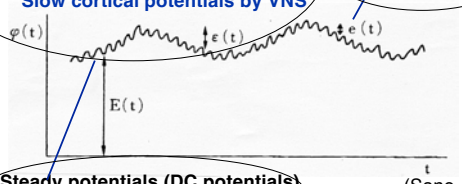
(a table made by Prof. T Maehara, Tokyo, Japan, 2024)

27

Schema of brain potentials

Slow potential shifts
ictal DC shifts
BP(MRCP)
CNV:
Nerofeedback (NFB)
Slow cortical potentials by VNS

AC potentials



Steady potentials (DC potentials)

(Sano, 1968)

DC amplifier or long time constant(10sec) of AC amplifier needed

28

Epilepsia, 37(7):662–674, 1996
Lippincott–Raven Publishers, Philadelphia
© International League Against Epilepsy

Subdural Recording of Ictal DC Shifts in Neocortical Seizures in Humans

Akio Ikeda, Kiyohito Terada, *Nobuhiro Mikuni, ‡Richard C. Burgess, §Youssef Comair, *Waro Taki, †Toshiaki Hamano, †Jun Kimura, ‡Hans O.Lüders, and Hiroshi Shibasaki

*Departments of Brain Pathophysiology, *Neurosurgery, and †Neurology, Kyoto University School of Medicine, Shogoin, Sakyo-ku, Kyoto, Japan; and Departments of ‡Neurology and §Neurosurgery, The Cleveland Clinic Foundation, Cleveland, Ohio, U.S.A.*

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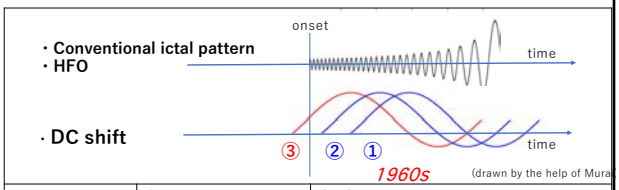
Hypothesis of active vs. passive DC shift in the ictal period



		③Active DC shift	② ① Passive DC shift
Clinical state		Chronic epilepsy	Acute symptomatic seizure
Clinical	patients	Habitual seizures	Non-habitual seizures
Basic	animals	Chronic model	Acute model
		Chronic pilocarpine model LGi1 rat model NER(=Noda epilepsy rat model)	Acute pilocarpine model

(by Ikeda et al, 2020, Neuroscience Research) (as the working hypothesis of AMED research team of Epilepsy and Glia, chaired by Maehara, Japan, 2015-2018)

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Clinical neurophysiological features of epileptic seizures

1) PDS (paroxysmal depolarization shifts)
2) Impaired extracellular K homeostasis by deceased Kir4.1, related ictal DC shifts

Contents lists available at ScienceDirect

Neuroscience Research

journal homepage: www.elsevier.com/locate/neures

Review article

Neuroscience Research 156 (2020) 95–101

Active direct current (DC) shifts and "Red slow": two new concepts for seizure mechanisms and identification of the epileptogenic zone

Akio Ikeda[a,*], Hirofumi Takeyama[b], Christophe Bernard[c], Mitsuyoshi Nakatani[d,e], Akihiro Shimotake[a], Masako Daifu[d], Masao Matsuhashi[a], Takayuki Kikuchi[f], Takeharu Kunieda[f,g], Riki Matsumoto[h], Tamaki Kobayashi[f], Kazuaki Sato[d]

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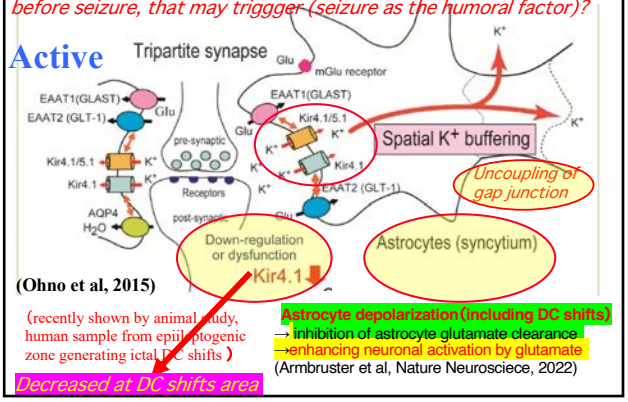
Impaired K⁺ homeostasis is important both after seizure and before seizure, that may triggger (seizure as the humoral factor)?



(Ohno et al, 2015)

(recently shown by animal study, human sample from epileptogenic zone generating ictal DC shifts)

Decreased at DC shifts area

Astrocyte depolarization (including DC shifts)
→ inhibition of astrocyte glutamate clearance
→enhancing neuronal activation by glutamate
(Armbruster et al, Nature Neurosciece, 2022)

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BRAIN COMMUNICATIONS

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JOURNAL ARTICLE ACCEPTED MANUSCRIPT

Ictal direct current shifts contribute to defining the core ictal focus in epilepsy surgery

Mitsuyoshi Nakatani, MD ✉, Morito Inouchi, MD, Masako Daifu-Kobayashi, MD, Tomohiko Murai, MD, Jumpei Togawa, MD, Shunsuke Kajikawa, MD, Katsuya Kobayashi, MD, Takefumi Hitomi, MD, Takeharu Kunieda, MD, Satoka Hashimoto, MD, Motoki Inaji, MD, Hiroshi Shirozu, MD, Kyoko Kanazawa, MD, Masaki Iwasaki, MD, Naotaka Usui, MD, Yushi Inoue, MD, Taketoshi Maehara, MD, Akio Ikeda, MD ✉

Brain Communications, fcac222, https://doi.org/10.1093/braincomms/fcac222

Published: 03 September 2022 **Article history ▾**

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Methods: patients and recording

AMED(Japan Agency for Medical Research and Development) study

5 institutes in Japan have participated in the study

Kyoto University Graduate School of Medicine, Kyoto
Tokyo Medical and Dental University, Tokyo
Nishi-Niigata Chuo National Hospital, Niigata
National Center Hospital, National Center of Neurology and Psychiatry, Tokyo
Shizuoka Institute of Epilepsy and Neurological Disorders, Shizuoka

Medically intractable focal epilepsy patients
- chronic placement of intracranial electrodes
- ECoG : sampling rate 1000 or 2000 Hz, time constant 10 sec

icDCs were defined as sustained negative and/or positive potentials longer than 3 sec, at least 200microV, preferentialy >1mV, viewed in a setting of a TC of 10 sec (Ikeda et al., 1999, Brain)

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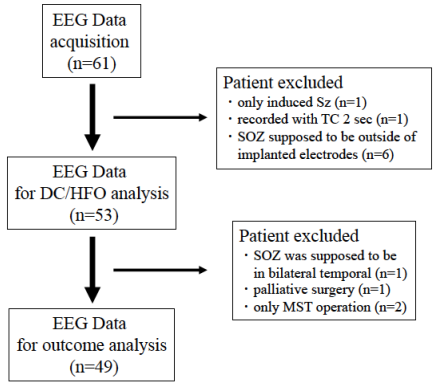
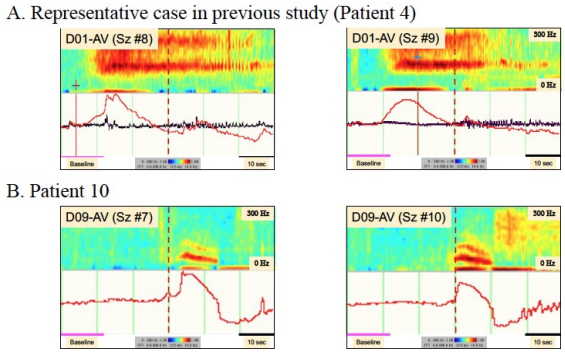
Large cohort studies on postoperative outcomes are still lacking.



37

Reproducible, patient-specific patterns were identified.
Ictal HFO frequency band was either stable or became slower



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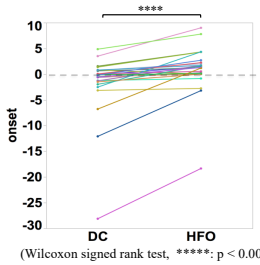
Results: onset time

In 27 out of 46 patients showing both ictal DC and ictal HFOs,
ictal DC onset time was statistically significantly earlier than ictalHFOs



conventional ECoG onset

ictal DC: -1.8 ± 6.0 (s)
ictal HFOs: +1.5 ± 5.5 (s)

(time 0: conventional ECoG seizure onset)

(Wilcoxon signed rank test, *****: $p < 0.001$)

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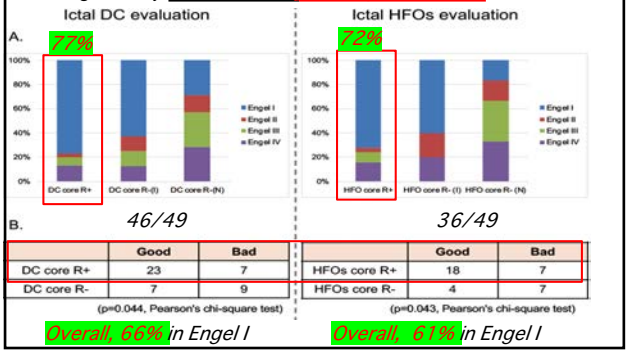
	Amplifier	Occurrence rate among patients (%) ictal DC	ictal HFOs	Occurrence rate among seizures (%) ictal DC	ictal HFOs	Correspondence of core electrodes of ictal DC and HFOs (%)	ictal DC amplitude (μV)	ictal DC duration (sec)	ictal HFOs frequency (Hz)	ictal HFOs duration (sec)
Nakatani et al., 2021 (n=61)	AC	92 >	71	86 >	62	39	1037 ± 570	15.8 ± 7.8 *	R (FR)	7.0 ± 4.1 *
Ikeda et al., 1999[30] (n=9)	AC	82 (subdural) 84 (scalp)	–	85 (subdural) 23 (scalp)	–	–	200 – (subdural) 50 – (scalp)	–	–	–
Modur et al., 2009[20] (n=1)	AC	100	100	100	75	10 – 75 ? (no detail)	–	~ 25	R	Sustained (no detail)
Kim et al., 2009[41] (n=11)	DC	91	–	69.5	–	–	800 – 10,000	1 – 493	–	–
Wu et al., 2014[4] (n=15)	AC	100	67	91	81	19.3	1,700 ± 910	5 – 180	R, FR	–
Kanazawa et al., 2015[5] (n=16)	AC	75	50	71.3	46.3	–	903.1 ± 462.8	35.5 ± 15.6	R, FR	10.7 ± 9.7
Thompson et al., 2016[24] (n=15)	AC	100	–	100	–	–	300 – 8,500	~ over 100	–	–

*: Long-lasting icDC or icHFOs beyond 30 sec analysis time-window after the seizure onset were excluded due to the limitation of the software.

40

Results: surgical outcome

Complete resection of ictal DC and ictal HFOs 'core' areas significantly **correlates with good surgical outcome.**



	Good	Bad
DC core R+	23	7
DC core R-	7	9

(p=0.044, Pearson's chi-square test)

	Good	Bad
HFOs core R+	18	7
HFOs core R-	4	7

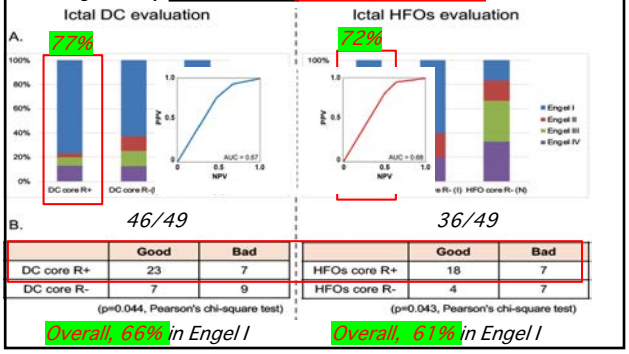
(p=0.043, Pearson's chi-square test)

Overall, 66% in Engel I Overall, 61% in Engel I

41

Results: surgical outcome

Complete resection of ictal DC and ictal HFOs 'core' areas significantly **correlates with good surgical outcome.**



	Good	Bad
DC core R+	23	7
DC core R-	7	9

(p=0.044, Pearson's chi-square test)

	Good	Bad
HFOs core R+	18	7
HFOs core R-	4	7

(p=0.043, Pearson's chi-square test)

Overall, 66% in Engel I Overall, 61% in Engel I

42

Conclusion

1) It is the first large cohort multi-institutional study on wide-band EEG analysis and postoperative outcomes in Japan.

2) icDCs onset was statistically earlier than icHFOs onset in both MTLE and Neocortical epilepsy.

3) icDCs more frequently recorded than icHFOs among both patients (92% vs. 71%) and seizures (86% vs. 62%).

4) Complete resection of the core area of icDCs significantly correlated with favorable outcomes, similar to icHFOs outcomes.

5) The independent significance of icDCs and icHFOs should be considered as reliable biomarkers to achieve favorable outcomes in epilepsy surgery.

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Clinical Neurophysiology 137 (2022) 113–121

Contents lists available at ScienceDirect

Clinical Neurophysiology

journal homepage: www.elsevier.com/locate/clinph

Two types of clinical ictal direct current shifts in invasive EEG of intractable focal epilepsy identified by waveform cluster analysis

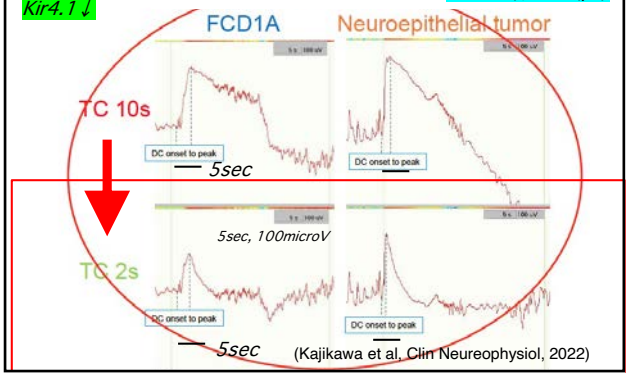
Shunsuke Kajikawa [a], Masao Matsuhashi [b], Katsuya Kobayashi [a], Takefumi Hitomi [c], Masako Daifu-Kobayashi [a], Tamaki Kobayashi [d,e], Yukihiro Yamao [e], Takayuki Kikuchi [e], Kazumichi Yoshida [f], Takeharu Kunieda [e,f], Riki Matsumoto [a,g], Akiyoshi Kakita [h], Takao Namiki [i], Ichiro Tsuda [j], Susumu Miyamoto [e], Ryosuke Takahashi [a], Akio Ikeda [b,*]

44

Type#1 DC shifts =rapid development, FCD1A

61%(Sz), 67%(pt)

Kir4.1↓



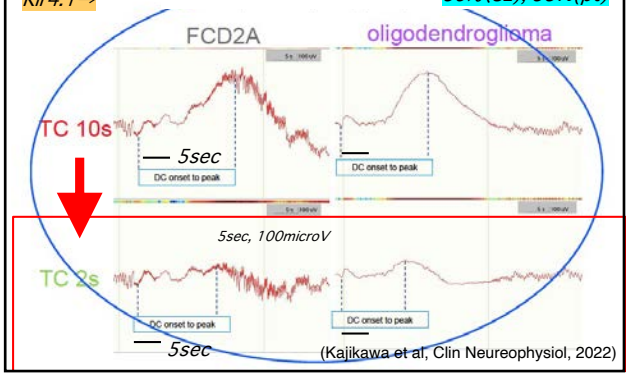
(Kajikawa et al, Clin Neureophysiol, 2022)

45

Type#2 DC shifts =slow development, FCD2A

39%(Sz), 33%(pt)

Kir4.1→



(Kajikawa et al, Clin Neureophysiol, 2022)

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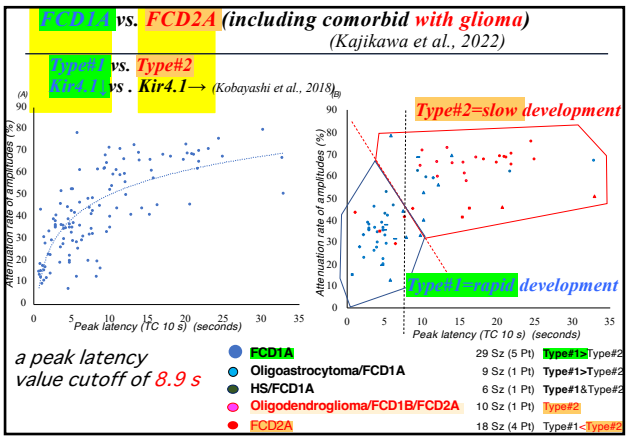

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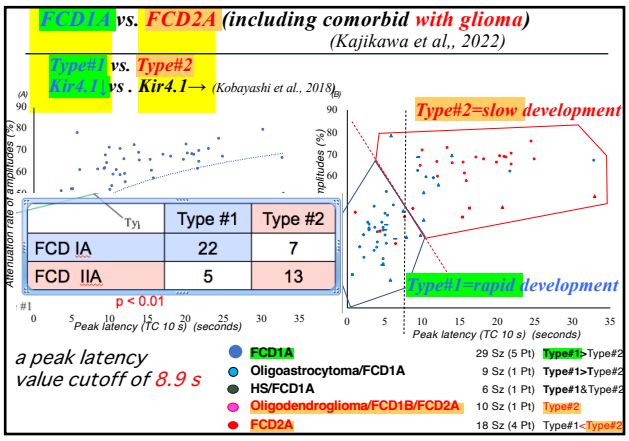

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Received: 17 March 2023 | Revised: 26 September 2023 | Accepted: 26 September 2023
DOI: 10.1111/epi.17782
Epilepsia™
RESEARCH ARTICLE

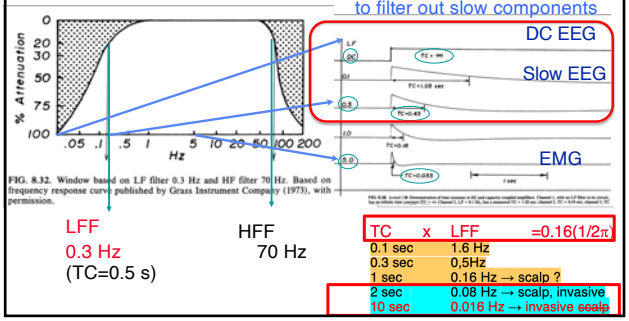
Focal ictal direct current shifts by a time constant of 2 seconds were clinically useful for resective epilepsy surgery

Masaki Izumi[1,2] | Katsuya Kobayashi[3] | Shunsuke Kajikawa[4] | Kyoko Kanazawa[5] | Yutaro Takayama[6] | Keiya Iijima[7] | Masaki Iwasaki[7] | Yoji Okahara[2] | Seiichiro Mine[8] | Yasuo Iwadate[1] | Akio Ikeda[9]

Most commonly used digital EEG (TC of 2sec) in the world is available, being as good as EEG used lesser (long TC of 10 sec)

49

1) TC is the attenuation marker for constant voltage activity
2) Brain DC (infraslow) generator is not constant, but dynamically changing with increment and decrement.



50

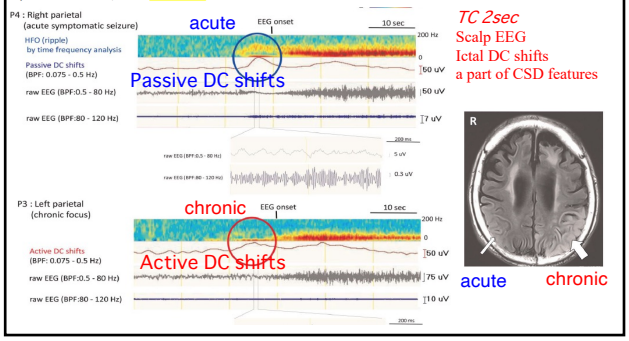
Wide-band EEG: a mysterious and very useful technique

1) What is the wide-band EEG?
2) Special machine? Special technique?
3) Is it useful? Is it redundant? Just only research?
4) Useful only in invasive EEG?
5) Is it recorded by scalp-EEG?
6) EEG technologist could analyse?

51

Scalp EEG Could Record Both Ictal DC Shift and HFO Together Even With a Time Constant of 2 Seconds (J Clin Neurophysiol 2020;37: 191–194)

Tomohiko Murai,* Takefumi Hitomi,*† Masao Matsuhashi,‡ Riki Matsumoto,* Yuki Kawamura,§ Masutaro Kanda,§ Ryosuke Takahashi,* and Akio Ikeda‡



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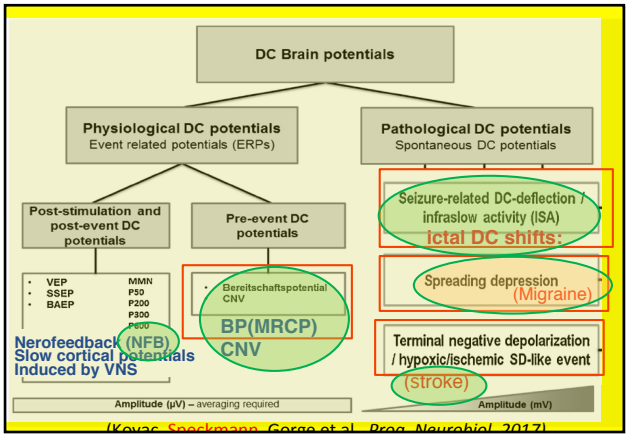
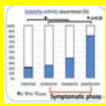


53

TC of 2sec scalp EEG could open the window for diagnosis, genenator mechanisms, and treatment in neurological disorders besides epilepsy

1) *Epilepsy*
Active DC shifts, Kir4.1, tripartite synapse, CSD
Cortical spreading depolarization

2) *Migraine aura is similar to epileptic aura in semiology involving posterior hemisphere*
delta slow, subdelta slow (1Hz >), occipital (30%)
(Hosokawa et al., Clin Neurophysiol, 2024)



3) *Cerebrovascular disease, Dementia*
transient focal neurological episode (*TFNEs*), infaslow activity (0.3Hz >)
Amyloid spell in cerebral amyloid angiopathy (*CAA*)

4) *Critical care, Head trauma*
Burst suppression with SISA(short infraslow activity) (Tougo et al, 2022)
Moyamoya disease (Hayashi et al., 2025, in press)

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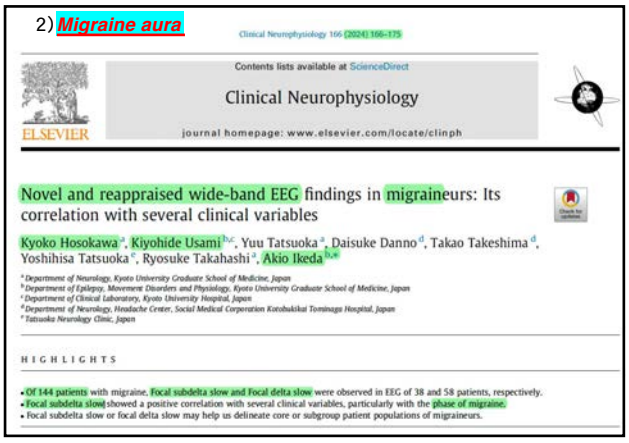
2) *Migraine aura*



Clinical Neurophysiology 166 (2024) 166–175
Contents lists available at ScienceDirect
Clinical Neurophysiology
journal homepage: www.elsevier.com/locate/clinph

Novel and reappraised wide-band EEG findings in migraineurs: Its correlation with several clinical variables

Kyoko Hosokawa [a], Kiyohide Usami [b,c], Yuu Tatsuoka [a], Daisuke Danno [d], Takao Takeshima [d], Yoshihisa Tatsuoka [e], Ryosuke Takahashi [a], Akio Ikeda [b,e]

[a] Department of Neurology, Kyoto University Graduate School of Medicine, Japan
[b] Department of Epilepsy, Movement Disorders and Physiology, Kyoto University Graduate School of Medicine, Japan
[c] Department of Clinical Laboratory, Kyoto University Hospital, Japan
[d] Department of Neurology, Headache Center, Social Medical Corporation Kotobukikai Tominaga Hospital, Japan
[e] Tatsuoka Neurology Clinic, Japan

HIGHLIGHTS

- Of 144 patients with migraine, Focal subdelta slow and Focal delta slow were observed in EEG of 38 and 58 patients, respectively.
- Focal subdelta slow showed a positive correlation with several clinical variables, particularly with the phase of migraine.
- Focal subdelta slow or focal delta slow may help us delineate core or subgroup patient populations of migraineurs.

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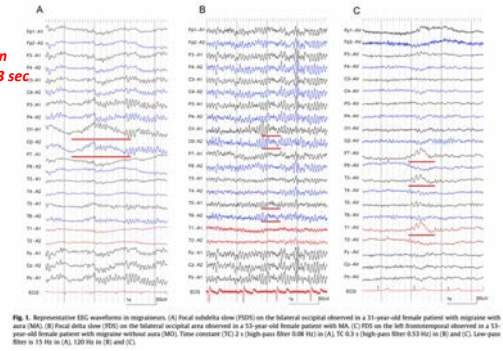
FSDS =Focal subdelta slow

FSDS=<1Hz: 1 cycle duration of >1sec and <3 sec



Hosokawa K, Clin Neurophysiol. 2024 Oct;166:166-175.

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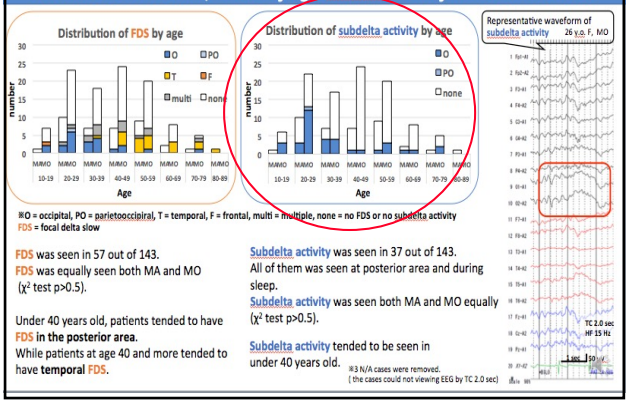
FDS was seen in 57/143, shifted by age./subdelta activity was seen in 37/143.



FDS was seen in 57 out of 143.
FDS was equally seen both MA and MO (χ^2 test p>0.5).

Under 40 years old, patients tended to have FDS in the posterior area.
While patients at age 40 and more tended to have temporal FDS.

Subdelta activity was seen in 37 out of 143.
All of them was seen at posterior area and during sleep.
Subdelta activity was seen both MA and MO equally (χ^2 test p>0.5).

Subdelta activity tended to be seen in under 40 years old.

※3 N/A cases were removed.
(the cases could not viewing EEG by TC 2.0 sec)

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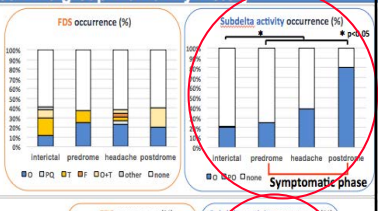
Subdelta activity was more frequently at symptomatic phase & significantly seen in a group with family history.

Each phase of migraine & EEG findings

- There was no EEG recorded during phase of aura.
- The occurrence of FDS was almost same at each phase.
- The occurrence of subdelta activity was more frequently at **symptomatic phase** than interictal phase (χ^2 test p=0.0347) .

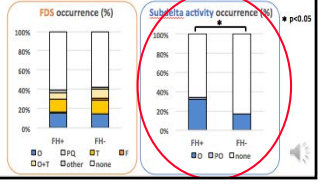
※ FDS = focal delta slow
※ symptomatic phase = predrome + headache + postdrome
※ 4 cases which have no data of phase were excluded.



Family history of migraine & EEG findings

- The occurrence of FDS was almost same in FH+ and FH-.
- Subdelta activity was significantly seen in **FH+** group (a group with family history of migraine) than in **FH-** group (χ^2 test p=0.0323).

※ FH = family history
FH+ = with family history, FH- = without family history
※ 4 cases which have no data of FH were excluded.



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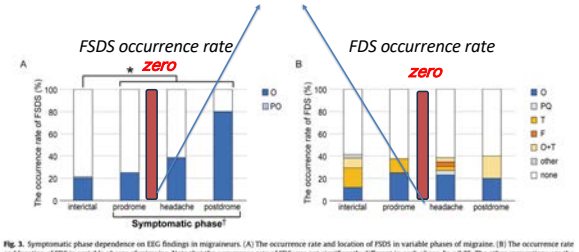
We patients during migraine aura were recorded among 144 patients



Hosokawa K, Clin Neurophysiol. 2024, Oct;166:166-175.

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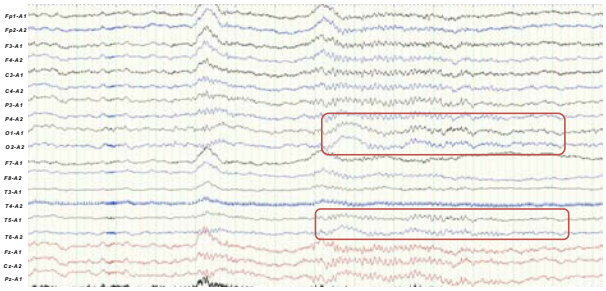
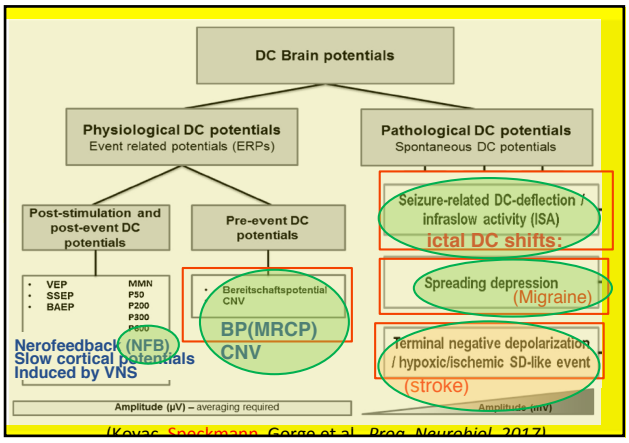
Scalp EEG during migraine aura, 22 yo woman

Monopolar montage, Sensitivity:10 μv, Time constant:2.0s, High cut filter:120Hz



Intermittent irregular sub-delta(1 cycle duration of >1sec and <3 sec) regional bilateral occipital

60



(Kovacs, Speckmann, Gorge et al., Prog. Neurobiol. 2017)

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TC of 2sec scalp EEG could open the window for diagnosis, genenator mechanisms, and treatment in neurological disorders besides epilepsy

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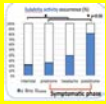

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Amyloid spell in cerebral amyloid angiopathy (CAA)

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Burst suppression with SISA(short infraslow activity) (Tougo et al, 2022)
Moyamoya disease (Hayashi et al., 2025, in press)

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Moyamoya disease (Hayashi et al., 2025, in press)

Slow and infraslow of scalp EEG is associated with transient neurological events (TNE) in Moyamoya disease

Kozue Hayashi[1], Kiyohide Usami[2], Masaya Togo[3], Yukihiro Yamao[4], Akihiro Shimotake[1], Takeshi Funaki[4], Takefumi Hitomi[5], Takayuki Kikuchi[4], Masao Matsuhashi[2], Kazumichi Yoshida[4], Susumu Miyamoto[4],Ryosuke Takahashi[1], Akio Ikeda[2]

1. Department of Neurology, Kyoto University
2.Department of Epilepsy, Movement Disorders and Physiology, Kyoto University
3. Department of Neurology, Kobe University
4.Department of Neurosurgery, Kyoto University
5. Department of Clinical Laboratory, Kyoto University

(Hayashi et al.,Clin Neurphyol,. 2025 , in press)

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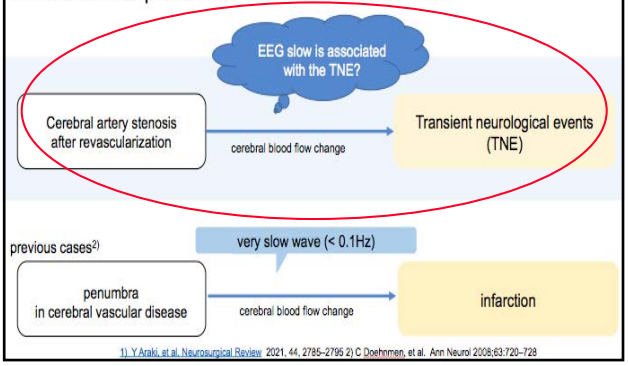
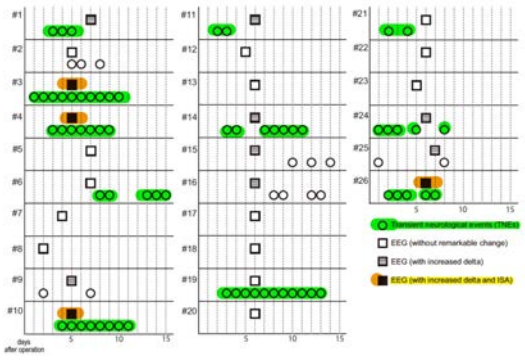
We focus on the **transient neurological event (TNE)**[1)] with moyamoya disease.
TNE is a common phenomenon after direct revascularization.



1) Y Araki, et al. Neurosurgical Review 2021, 44, 2785–2795 2) C Doehmen, et al. Ann Neurol 2006;63:720–728

65

ISA occurred on the same day of TFNEs, delta only did not



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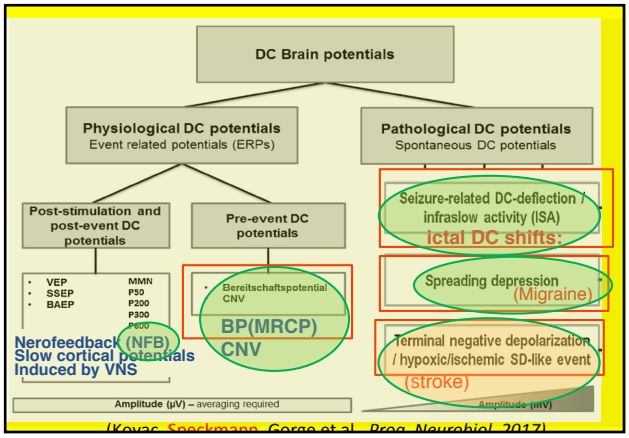

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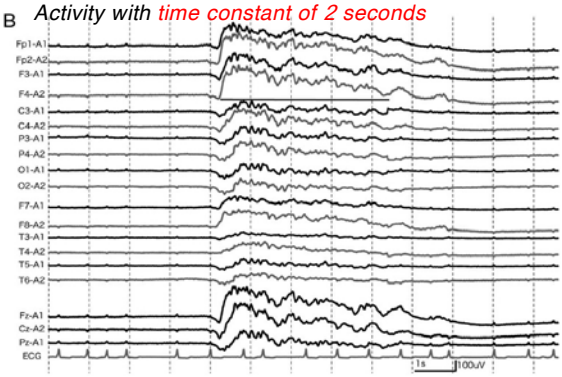
B Activity with time constant of 2 seconds



Burst spikes=PDS(from Neuron) & SISA(most likely from astrocyte)

(Tougo et al, J clin Neurophysiol, 2022)

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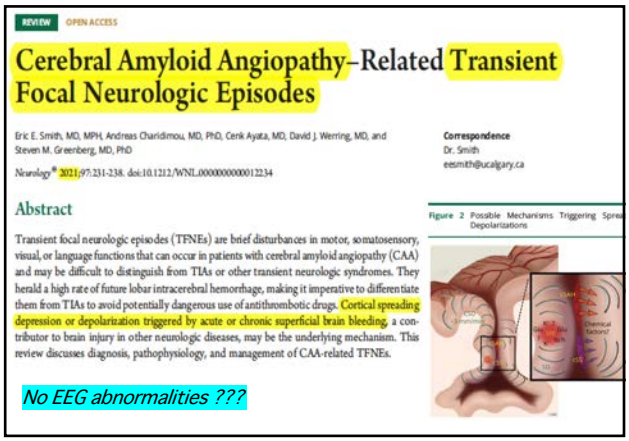

REVIEW OPEN ACCESS

Cerebral Amyloid Angiopathy–Related Transient Focal Neurologic Episodes

Eric E. Smith, MD, MPH, Andreas Charidimou, MD, PhD, Cenk Ayata, MD, David J. Werring, MD, and Steven M. Greenberg, MD, PhD

Correspondence
Dr. Smith
eesmith@ucalgary.ca

Neurology® 2021;97:231-238. doi:10.1212/WNL.0000000000012234

Abstract

Transient focal neurologic episodes (TFNEs) are brief disturbances in motor, somatosensory, visual, or language functions that can occur in patients with cerebral amyloid angiopathy (CAA) and may be difficult to distinguish from TIAs or other transient neurologic syndromes. They herald a high rate of future lobar intracerebral hemorrhage, making it imperative to differentiate them from TIAs to avoid potentially dangerous use of antithrombotic drugs. Cortical spreading depression or depolarization triggered by acute or chronic superficial brain bleeding, a contributor to brain injury in other neurologic diseases, may be the underlying mechanism. This review discusses diagnosis, pathophysiology, and management of CAA-related TFNEs.

Figure 2 Possible Mechanisms Triggering Spreading Depolarizations

No EEG abnormalities ???

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Japan Agency for Medical Research and Development (AMED)
International Collaborative Research Program

Implementation study of wide band EEG recording, analysis and dissemination in epilepsy care using digital EEG in Indonesia
2022–2026

インドネシアでの、てんかん診療の質向上をめざした
デジタル脳波のワイドバンド成分の
記録解析普及の実装研究

日本医療研究開発機構
地球規模保健課題解決推進のための研究事業
キックオフミーティング

京都大学大学院医学研究科てんかん・運動異常生理学講座教授
京都大学医学部附属病院てんかん診療支援センター長
池田昭夫

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January 31, 2025

AMED (Japan Agency for Medical Research and Development) Supports

International Collaboration

Implementation of wide band EEG in epilepsy care by digital EEG

Lecture:

Wide Band EEG Analysis

Now ready for clinical implementation

Akio IKEDA, MD, PhD, FACNS

Department of Epilepsy, Movement Disorders & Physiology

Kyoto University Graduate School of Medicine

Kyoto, JAPAN

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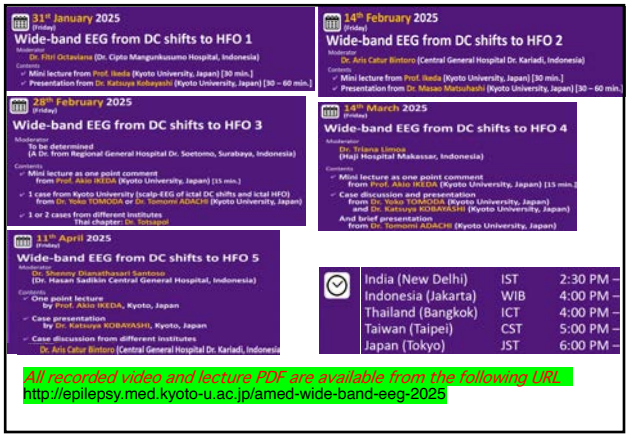

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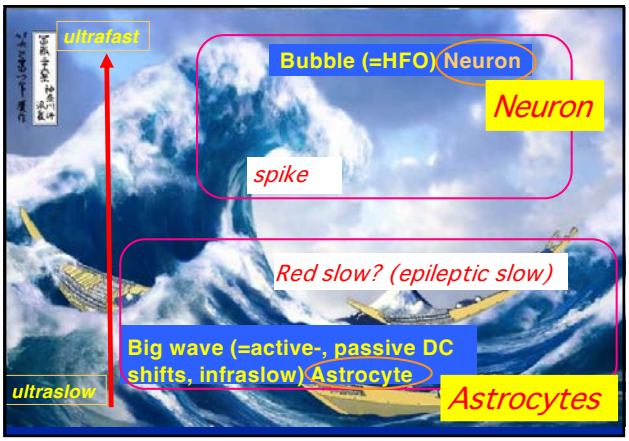

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Current collaborators

Kyoto University School of Medicine
Department of Epilepsy, Movement Disorders and Physiology
Matsuhashi M, MD, Shimotake A,MD, Hitomi T,MD, Inouchi M,MD,
Department of Neurology
Kajikawa S, MD Nakatani N, MD, Murai T, MD, Togawa J,MD, Inoue T,MD, Daifu M, MD, Oi K, MD, Tojima M,MD, Takatani M, MD, Takahashi R, MD, Matsumoto R, MD
Department of Neurosurgery
Kobayashi T, MD, Kikuchi T, MD, Yoshida K, MD, Miyamoto S,MD
Ehime University School of Medicine
Kunieda T,MD

Non-linear Neuro-oscillology (Grant-in-Aid for Scientific Research on Innovative Areas, MEXT)
Tsuda I, PhD, Namiki T, PhD, Kitano K,PhD, Aoyagi T, PhD, Kitajo K, PhD

Epilepsy and Glia (AMED)
Ohno Y, PhD, Sato K, MD (Osaka), Kakita A, MD, Kitaura H, PhD (Niigata), Maehara T, MD (Tokyo)

International
Bernard C, PhD (Marseille), Le Van Quyen M, PhD (Paris), de Curtis M (Mirano)

(And many others.....)

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