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Supplemental information

Dynamics of AMPA receptors regulate

epileptogenesis in patients with epilepsy

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Patient	Gender/age,y	Onset age,y	Duration,y	Seizure type	Estimated	
					epileptogenic focus	
1	M/33	11	22	FIAS/FAS	Left temporal lobe	
2	M/48	25	23	FIAS/FAS	Right temporal lobe	
3	M/26	26	1	FIAS	Left temporal lobe	
4	M/38	11	27	FIAS	Right temporal lobe	
5	M/38	29	9	FIAS/FAS	Frontal lobe	

Table S1. Patient characteristics of focal onset seizures without generalized seizure, Related toFigure 1 and 2.

FIAS: Focal impaired awareness seizure, FAS: Focal aware seizure.

Patient	Gender /age,y	Onset	Duration,y	Seizure type	Estimated	
		age,y			epileptogenic	
					focus	
6	M/25	0	25	FIAS/FAS+FBTCS	Right	
					hypothalamus	
7	M/21	13	8	FIAS+FBTCS	Left temporal	
					lobe	
8	M/50	10	40	FIAS+FBTCS	Bilateral	
					temporal lobe	
9	M/25	9	16	FAS +FBTCS	Right frontal	
					lobe	
10	M/55	53	2	FIAS+FBTCS	Right frontal	
					lobe	
11	M/35	6	29	FAS +FBTCS	Left occipital	
					lobe	
12	M/39	18	20	FIAS+FBTCS	Right frontal	
					lobe	
13	M/45	31	14	FIAS+FBTCS	Unknown	
14	M/30	28	2	FIAS+FBTCS	Right temporal	
					lobe	
15	M/31	14	17	FIAS+FBTCS	Left temporal	
					lobe	
16	M/21	15	6	FAS +FBTCS	Left frontal lobe	
17	M/46	4	42	FIAS+FBTCS	Unknown	
18	M/30	20	10	FIAS+FBTCS	Right frontal	
					lobe	
19	M/31	11	14	FIAS+FBTCS	Left frontal lobe	
20	M/50	42	8	FIAS+FBTCS	Left temporal	
					lobe	
21	M/26	20	6	FIAS+FBTCS	Left temporal	
					lobe	
22	M/47	10	37	FIAS/FAS+FBTCS	Left temporal	
					lobe	

Table S2. Patient characteristics of focal to bilateral tonic clonic seizures, Related Figure 1 and 3FIAS: Focal impaired awareness seizure, FAS: Focal aware seizure, FBTCS: Focal to bilateral tonicclonic seizure.

Patient	Gender /age,y	Onset age,y	Duration,y	Seizure type
23	M/28	12	16	GOTC
24	M/23	14	9	GOTC
25	M/20	12	8	GOTC
26	M/29	15	14	GOTC
27	M/49	13	36	GOTC
28	M/37	24	2	GOTC
29	M/26	24	2	GOTC
30	M/29	24	5	GOTC

GOTC: Generalized onset tonic clonic.

Figure S1



Figure S1. Positive correlation between the amount of cell surface AMPAR and the amplitude of gamma activity in focal epilepsy detected by multiple electrode sites, Related to Figure 1 SPM analysis of [¹¹C]K-2 in patients with the focal onset seizures identifies the brain regions showing a significant positive correlation between SUVR_{30-50 min} with white matter as a reference and the amplitude of gamma activity in Cz,T6 electrode site (p < 0.05, T > 1.72, one-tailed, FDRc). Scale bar indicates T value of this correlation. R: right side, L: left side, A: anterior side, P: posterior side.

FigureS2



Figure S2. Positive AMPAR-gamma activity couplings are observed in patients with the focal onset seizures without generalized seizure detected by multiple electrode sites, Related to Figure 2

SPM analysis of [¹¹C]K-2 in patients with the focal onset seizures without generalized seizure identifies the brain regions showing a significant positive correlation between $SUVR_{30-50 \text{ min}}$ with white matter as a reference and the amplitude of gamma activity in Fp1, Fp2, F3, F4, Fz, T3, T4, C3, T5, T6, P3, P4, Pz, O1, O2 electrode site (p < 0.05, T > 2.35, one-tailed, FDRc). Scale bar indicates T value of this correlation. R: right side, L: left side, A: anterior side, P: posterior side.

FigureS3

R Axial							Electrode site Fp1	Axial	R			y	•		Electrode si T5
R Coronal A								Corona	R al A			23		P	
Sagittal			A O		\mathcal{O}	$\langle \rangle$	0.000	Sagitta			θο		$\langle \cdot \rangle$		0.000
		T va	lue (Pos	itive corre	elation wi	ith theta)			D	T va	alue (Pos	itive corr	elation w	ith theta)	
R Axial				·**			Electrode site Fp2	Axial					· r		Electrode si T6
Coronal A								Corona	al 🚱					P	
Sagittal				35			0.3000	Sagitta			1				0.000
R Axial			1. 				Electrode site F3	Axial	R						Electrode si C3
R Coronal						2		Corona							
Sagittal			The second				0.3060	Sagitta			a construction of the second s		$\langle \rangle$		0.0000
R Axial					iy)		Electrode site F4	Axial	R			in the second se			Electrode si C4
R Coronal	\bigcirc		(Vrj			X	L R	l Corona	R I						
Sagittal					C?		03069	Sagittal			1	2724	C?		0000
R Axial				37			Electrode site Fz	Axial	R						Electrode si O1
R Coronal						2	L R	Corona	R al						00000
Sagittal				7.2			03069	Sagitta		\mathcal{A}					0.000
R Axial							Electrode site F7	Axial	R						Electrode si O2
R Coronal A			?				L R	Corona	R al A					() P	
Sagittal							0.000	Sagitta				<u> </u>	(i)		0.000
R Axial							Electrode site F8	Axial				· ·			Electrode si P3
R Coronal A								Corona	R al A					P	
Sagittal			the second	A.			0.3000	Sagitta				æ	\mathcal{O}		0000
R Axial							Electrode site T3	Axial							Electrode si P4
Coronal A								Corona	A					P	
Sagittal							83866	Sagitta	R		74		(7)		0000
Axial R					(\cdot)		Electrode site T4	Axial	ß						Electrode si Pz
Coronal A								Corona	A A		(Vij			P	
Sagittal							0.909.9	Sagitta				1997 C	(7)		0.000

Figure S3. Positive AMPAR-theta activity couplings are observed in patients with the focal onset seizures without generalized seizure detected by multiple electrode sites, Related to Figure2

SPM analysis of [¹¹C]K-2 in patients with the focal onset seizures without generalized seizure identifies the brain regions showing a significant positive correlation between SUVR_{30-50 min} with white matter as a reference and the amplitude of theta activity in Fp1, Fp2, F3, F4, Fz, F7, F8, C3, C4, T3, T4, T5, T6, P3, P4, Pz, O1,O2 electrode site (p < 0.05, T > 2.35, one-tailed, FDRc). Scale bar indicates T value of this correlation. R: right side, L: left side, A: anterior side, P: posterior side.

Figure S4



Figure S4. Generalized onset seizure downregulates AMPAR levels detected by multiple electrode sites, Related to Figure 4

SPM analysis of $[^{11}C]$ K-2 in patients with the generalized onset seizures identifies the brain regions showing a significant negative correlation between SUVR₃₀₋₅₀ min with white matter as a reference and the amplitude of gamma activity in C3, C4, T5, T6, P3, P4 electrode sites (p < 0.05, T > 1.94, one-tailed, FDRc). Scale bar indicates T value of this correlation. R: right side, L: left side, A: anterior side, P: posterior side.