TABLE S1. Biomarkers in Alzheimer's disease patients.

Patient No.[a]	Amyloid Imaging[b]	CSF Biomarkers	Brain MRI
1	Positive	Aβ42=129[d] t-Tau=243[d] p-Tau=55[d]	L > R parietal atrophy
2	Positive	–	Bilateral hippocampal atrophy and L > R occipital and parietal atrophy
3	Positive	Aβ42=294.0 t-Tau=833.7 p-Tau=113.6[c] Aβ42-Tau Index=0.24[c]	R > L hippocampal atrophy and diffuse cortical atrophy with posterior predominance
4	Positive	Aβ42=182.7 t-Tau=528.5 p-Tau=90.0[c] Aβ42-Tau Index=0.21[c]	Bilateral parietal atrophy
5	Positive	–	Diffuse cortical atrophy with posterior predominance
6	Positive	–	Global atrophy

7	–	–	Bilateral parietal atrophy
8	Positive	–	L > R hippocampal and parietal atrophy, white matter changes consistent with cerebral amyloid angiopathy
9	Positive	–	L > R hippocampal, occipital, and parietal atrophy
10	Positive	–	L > R parietal atrophy
11	Positive	–	Diffuse atrophy predominantly in the hippocampi and posterior cortex
12	–	Aβ42=399.3 t-Tau=441.8 p-Tau=68.6[c] Aβ42-Tau Index=0.52[c]	R > L hippocampal and parietal atrophy
13	Positive	–	Bilateral parietal atrophy with posterior predominance
14	Positive	–	Diffuse cortical atrophy with L > R parietal atrophy

15[e]	–	–	Bilateral hippocampal and parietal atrophy
16	Positive	–	Bilateral hippocampal atrophy and R > L posterior cortical atrophy
17	Positive	Aβ42=143[d] t-Tau=71[d] p-Tau=18[d]	Hippocampal atrophy and diffuse cortical atrophy most prominent in the L > R occipital and parietal lobes
18	–	–	L > R hippocampal atrophy and diffuse cortical atrophy
19	Positive	–	Generalized atrophy, most prominent in L > R hippocampal and parietal regions
20	Positive	–	Bilateral hippocampal and parietal atrophy
21	Positive	–	Bilateral atrophy of temporoparietal junction with particular involvement of supramarginal and angular gyri
22[e]	–	–	R > L hippocampal atrophy and diffuse cortical atrophy most prominent in bilateral dorsal parietal regions

23	–	–	Bilateral hippocampal and parietal atrophy
24	–	–	Bilateral hippocampal atrophy
25	–	Aβ42=399.5 t-Tau=527.6 p-Tau=70.5[c] Aβ42-Tau Index=0.46[c]	Bilateral hippocampal atrophy and L > R parietal atrophy
26	–	Aβ42=125.0 t-Tau=559.4 p-Tau= 82.0[c] Aβ42-Tau Index=0.14[c]	Bilateral hippocampal atrophy
27	Positive	–	L > R hippocampal atrophy and diffuse cerebral atrophy with posterior predominance
28	–	Aβ42=210.3 t-Tau=504.3 p-Tau=79.8[c] Aβ42-Tau Index=0.25[c]	L > R parietal atrophy
29	–	–	L > R parietal atrophy

30[e]	–	–	Bilateral hippocampal atrophy and diffuse cortical atrophy with posterior predominance
31	Positive	–	R > L parietal atrophy
32	Positive	–	Bilateral parietal atrophy
33	–	–	Bilateral hippocampal and parietal atrophy

[a]Patients 1–14 had subclinical epileptiform activity.

[b]Positron emission tomography agent was ^{18}F-AV-45 for patients 3, 4, 6, and 32, and ^{11}C-Pittsburgh compound B for the remainder of the patients.

[c]Values supporting a diagnosis of Alzheimer's disease were p-Tau level >61 pg/ml and Aβ42-Tau Index <1.0 (Athena Diagnostics).

[d]Values supporting a diagnosis of Alzheimer's disease were Aβ42 level <192 pg/ml, t-Tau level >93 pg/ml, and p-Tau level >23 pg/ml (Alzheimer's Disease Neuroimaging Initiative Biomarker Core at the University of Pennsylvania)[1].

[e]Alzheimer's disease was confirmed by autopsy according to National Institute on Aging–Reagan Institute criteria[2].

Aβ42 = amyloid-β peptide ending in amino acid residue 42; CSF = cerebrospinal fluid; L = left; MRI = magnetic resonance imaging; p-Tau = tau phosphorylated at threonine 181; R = right; t-Tau = total tau.

TABLE S2. Distribution and frequency of epileptiform activity in Alzheimer's disease patients.

			LTM-EEG EPILEPTIFORM ACTIVITY			M/EEG EPILEPTIFORM ACTIVITY		
Patient No.	**Diagnosis**	**H**	**Lead Localization**	**Predominant Region**	**Events per Hour**	**Modality[a]**	**Predominant Region**	**Events per Hour**
1	AD-Language	R	T5 > T3	L Temporal	0.15	MEG > EEG	L Temporal	5
2	AD-PCA	R	C3	L Central	0.03	MEG	R Parietal	2
3	AD	R	F4 > Cz > F3 > C3 > F7 > FP1	R Frontal	5.18	EEG > MEG	R Frontal	1
4	AD	L	T3 > T5	L Temporal	0.24	MEG > EEG	Bilateral Temporal	7
5	AD	R	C3 > F3	L Central	1.51	–	–	–
6	AD	R	Fp1, Fp2, F3, and F4 > T3 and T4	Bilateral-Frontal-Temporal	0.39	–	–	–
7	AD-PCA	R	T3 > F3 > F4	L Temporal	0.21	–	–	–
8	AD	R	–	–	–	MEG	R Central	20

9	AD-PCA	R	–	–	–	MEG and EEG	R Temporal	4
10	AD-Language	L	–	–	–	MEG	R Temporal	1
11	AD	R	–	–	–	MEG	R Temporal	5
12	AD	R	–	–	–	MEG	R Temporal-Parietal-Posterior Insular	9
13	AD-PCA	R	–	–	–	MEG and EEG	R Central-Parietal	2
14	AD	R	–	–	–	MEG	L Peri-rolandic and Posterior Insular	2

[a]Modality indicates the neurophysiological monitoring system on which epileptiform activity was observed, and the > sign indicates that the epileptiform activity was more distinct on one of the modalities.

AD = Alzheimer's disease; AD-Language = Alzheimer's disease with predominantly language symptoms; AD-PCA = Alzheimer's disease with posterior cortical atrophy and predominantly visuospatial symptoms; H = handedness; L = left; EEG = electroencephalography; LTM-EEG = long-term monitoring with video-electroencephalography; MEG = magnetoencephalography; M/EEG = magnetoencephalography with simultaneous electroencephalography; R = right.

TABLE S3. Background slowing on long-term monitoring with video-EEG.

Slowing	Controls (n = 19)	AD Patients (n = 33)	*p*[a]	AD without Epileptiform Activity (n = 26)	AD with Epileptiform Activity (n = 7)	*p*[a]
None	15 (78.9%)	19 (57.6%)	0.12	15 (57.7%)	4 (57.1%)	1.0
Generalized	1 (5.3%)	10 (30.3%)	0.04	9 (34.6%)	1 (14.3%)	0.40
Asymmetric	1 (5.3%)	3 (9.1%)	1.0	1 (3.8%)	2 (28.6%)	0.11
Focal	2 (10.5%)	1 (3.0%)	0.55	1 (3.8%)	0 (0.0%)	1.0

[a]Statistical tests were Pearson χ^2 or Fisher exact tests.

TABLE S4. Background slowing on magnetoencephalography with simultaneous EEG.

Slowing	Controls (n = 19)	AD Patients (n = 33)	*p*[a]	AD without Epileptiform Activity (n = 22)	AD with Epileptiform Activity (n = 11)	*p*[a]
None	17 (89.5%)	10 (30.3%)	< 0.0001	9 (40.9%)	1 (9.1%)	0.11
Generalized	0 (0.0%)	14 (42.4%)	0.0009	9 (40.9%)	5 (45.5%)	1.0
Asymmetric	1 (5.3%)	7 (21.2%)	0.23	3 (13.6%)	4 (36.4%)	0.19
Focal	1 (5.3%)	2 (6.1%)	1.0	1 (4.5%)	1 (9.1%)	1.0

Readings combine findings from magnetoencephalography and simultaneous EEG recordings.

[a]Statistical tests were Pearson χ^2 or Fisher exact tests.

TABLE S5. Neuropsychological test performance of Alzheimer's disease patients and age-matched controls.

	AD without Epileptiform Activity (n = 12–19)	**AD with Epileptiform Activity (n = 7–14)**	**Controls (n = 16–19)**
Global Cognitive Performance and Function			
MMSE[3]	21.0 (16.0–24.0)	22.5 (18.8–24.0)	29.6 (29.0–30.0)
CDR[4]	1.0 (1.0–2.0)	1.0 (0.5–1.0)	0.0 (0.0 – 0.0)
CDR-SOB[4]	5.0 (4.5–8.0)	4.8 (4.0–7.0)	0.0 (0.0 – 0.0)
Episodic Memory			
Visual free recall (Benson 10 minutes)[5]	2.0 (0.0–4.3)	2.5 (0.3–7.5)	12.7 (11.0–15.0)
Short-delay verbal free recall (CVLT)[6]	3.1 ± 1.9 (of 9 possible)	3.5 ± 2.4 (of 9 possible)	11.1 ± 2.8 (of 16 possible)
Long-delay verbal free recall (CVLT)[6]	0.5 (0.0–3.0) (of 9 possible)	1.0 (0.0–3.5) (of 9 possible)	11.9 ± 3.5 (of 16 possible)
Executive Function & Working Memory			
Design fluency[7]	4.5 (3.3–7.0)	6.5 (2.0–9.0)	12.7 ± 4.4
Information processing speed (Stroop color naming)[8,9]	49.1 ± 27.5	51.3 ± 24.6	91.5 ± 12.0
Cognitive control (Stroop inhibition)[8,9]	17.0 (6.8–25.3)	11.0 (5.0–32.0)	55.1 ± 11.0
Verbal working memory (Digit span forward)[10]	5.0 (4.0–5.0)	5.0 (4.0–7.0)	7.3 ± 1.5
Attention (Digit span backward)[10]	3.0 (2.0–3.3)	3.0 (3.0–3.3)	5.8 (5.0–7.0)
Set shifting (Modified trails – speed)[10]	0.07 (0.02–0.31)	0.14 (0.04–0.4)	0.7 ± 0.3

Verbal learning (CVLT total score)[6]	16.7 ± 5.9 (of 36 possible)	16.1 ± 5.2 (of 36 possible)	51.9 ± 9.7 (of 80 possible)
Language			
Reading of 6 irregular words	6.0 (5.8–6.0)	6.0 (4.0–6.0)	6.0 (6.0–6.0)
Syntax comprehension[11]	3.2 ± 1.4	3.1 ± 1.3	4.8 (4.5–5.0)
Verbal agility (correct repetitions of multisyllabic word in 5 sec)	5.0 (3.0–6.0)	4.0 (2.0–6.0)	5.9 (6.0–6.0)
Boston Naming Test[12,13]	12.2 ± 2.5	11.6 ± 3.2	14.6 (14.0–15.0)
Lexical fluency (D words/1 minute)[14,15]	8.7 ± 5.1	10.3 ± 4.7	17.4 ± 6.8
Category fluency (Animals/1 minute)[14,15]	10.8 ± 5.5	9.6 ± 4.9	22.4 ± 5.0
Repetition of 5 phonemically complex sentences	3.5 (2.0–5.0)	4.0 (1.5–4.5)	4.8 (5.0–5.0)
Visuospatial Function			
Face discrimination (CATS – face matching)[16]	11.5 (10.0–12.0)	11.0 (9.0–12.0)	11.5 (11.5–12.0)
Visuoconstruction (Benson copy)[5]	14.0 (4.0–15.0)	13.0 (4.0–14.0)	15.3 (14.0–16.0)
Location discrimination (VOSP number location)[17]	5.7 ± 2.4	5.4 ± 2.9	8.9 (8.0–10.0)
Calculations[10]	2.8 ± 1.5	2.5 ± 1.1	4.7 (5.0–5.0)
Emotion naming (CATS – affect naming)[16]	12.0 (11.0–13.0)	12.0 (9.8–13.0)	12.3 ± 1.8

Data represent means ± SD or medians with interquartile ranges in parentheses.

AD = Alzheimer's disease; MMSE = Mini-Mental State Examination; CDR = Clinical Dementia Rating; CDR-SOB = CDR Sum of Boxes; CVLT = California Verbal Learning Test containing nine items for AD patients and 16 items for controls; CATS = Comprehensive Affect Testing System; VOSP = Visual Object and Space Perception.

TABLE S6. Longitudinal changes in Mini-Mental State Examination (MMSE) scores in Alzheimer's disease patients with or without epileptiform activity.

Patient No.	Epileptiform Activity?	Visit Time (Months)	MMSE
1	Yes	0.0	28
		12.4	27
		26.0	24
		41.2	5
		53.4	3
2	Yes	0.0	18
		4.4	17
		12.5	17
		27.4	13
		44.0	5
3	Yes	0.0	26
4	Yes	0.0	24
5	Yes	0.0	23
		17.4	20
		80.4	0
6	Yes	0.0	23
		1.7	20
		14.4	21
7	Yes	0.0	17
8	Yes	0.0	19
9	Yes	0.0	15
		12.3	11
10	Yes	0.0	26
		13.4	24
		26.7	20
		40.2	4
11	Yes	0.0	23
		25.8	9
12	Yes	0.0	17

		11.7	16
13	Yes	0.0	26
		13.8	20
		27.5	25
		45.7	16
		96.5	1
14	Yes	0.0	26
		12.7	22
		29.7	25
15	No	0.0	29
		12.9	26
		25.8	25
		37.1	22
		47.6	20
		59.6	20
		75.7	15
16	No	0.0	23
		5.2	26
		21.4	22
		35.4	17
		55.1	10
17	No	0.0	27
		14.3	26
		32.5	26
		44.6	19
		69.9	9
18	No	0.0	29
		12.2	29
		24.8	27
		38.3	27
		50.8	28
		64.0	25
19	No	0.0	25
		12.2	21

		29.0	13
20	No	0.0	17
		12.0	11
21	No	0.0	24
		4.9	26
		17.3	25
		26.7	22
22	No	0.0	23
		4.2	22
23	No	0.0	23
		19.5	22
		19.7	21
24	No	0.0	17
25	No	0.0	22
		10.2	27
		22.4	29
		35.3	28
26	No	0.0	23
		17.5	22
		28.1	18
27	No	0.0	15
28	No	0.0	21
29	No	0.0	24
		13.8	28
30	No	0.0	16
		20.6	16
31	No	0.0	21
		14.1	21
32	No	0.0	24
33	No	0.0	26
		75.6	14
		83.5	14

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