On-line Table: Clinical, EEG, and imaging findings								
No.	Age (yr)/ Sex	Epilepsy Syndrome	Structural MRI	Semiology	Phase I (Ictal Video Telemetry, Surface EEG)	Phase II (Invasive EEG/PET/SPECT)	Op/Pathology	Outcome Engel Class
1	49/M	MTLE R	HS R	Vocalizations, head turning to R, bimanual automatisms		Surface + foramen ovale electrodes: seizure onsets R mesiotemporal	sAHE R 03/07	I
2	31/F	MTLE R	HS R	Head version to L, figure 4 sign with L tonic posturing	EEG consistent with R mesiotemporal seizure onsets		sAHE R 01/09	I
3	53/F	MTLE R	HS R	Epigastric aura, vocalizations, oromandibular automatisms, head turning to R, postictal cuffing	EEG consistent with R mesiotemporal seizure onsets		sAHE R 04/08	I
4	48/M	MTLE R	HS R	Epigastric aura, oromandibular automatisms, SG	EEG consistent with R mesiotemporal seizure onsets			
5	30/M	MTLE R	Hippocampal atrophy R	Epigastric aura, head turning to L, tonic posturing L, R manual automatism, SG		Surface + foramen ovale electrodes: seizure onsets R mesiotemporal PET: hypometabolism temporomesial and temporopolar R, mesiotemporal L and insular region L Ictal SPECT: L temporal hyperperfusion	sAHE R 08/07	I
6	31/F	MTLE L	HS L	Epigastric aura, head turning to R, bimanual and perioral automatisms		Surface + foramen ovale: seizure onsets L mesiotemporal	Scheduled	
7	68/F	MTLE R	HS R	Nausea, oromandibular automatisms	EEG consistent with R mesiotemporal seizure onsets		sAHE R 03/08	II
8	25/F	MTLE R	N	From sleep, screaming, head turning to L, bimanual automatisms, verbalizations, SG		EEG with strip and depth electrodes: seizure onset in the R amygdale	Amygdalectomy and resection tmp R 9/09	IV
9	54/F	MTLE R	HS R	Strange feeling, oromandibular automatisms and bilateral arm automatisms		Surface + foramen ovale electrodes: seizure onset R mesiotemporal	sAHE R 12/09	I
10	36/F	MTLE R	HS R	Behavioral arrest, manual automatisms R, dystonic posturing L arm	EEG consistent with R mesiotemporal seizure onset		Scheduled	
11	27/M	LTLE L	N	Arrest reaction, speech arrest, tonic posturing, oral automatisms, SG		EEG with strip and depth electrodes: L temporolateralpolar seizure onset	Lesionectomy tmp L/DCM, 11/08	I
12	48/F	FLE R	DCM R frontal	Elevation of both arms, head turning to R, arrest reaction, dystonic posturing L hand		EEG with strip and depth electrodes: R frontal seizure onset in the vicinity of the lesion	Lesionectomy frontal R/DCM 08/09	I
13	27/M	PLE L	DCM L parietal	Aura with nervousness, tonic-clonic R arm		EEG with grid electrodes: L parietal seizure onset in the vicinity of the lesion		
14	56/F	LTLE R	N	Behavioral arrest, head version to the R		EEG with strip and depth electrodes: R temporolateral seizure onset	Scheduled	
15	20/F	LTLE L	HS L	Behavioral arrest, head turning to the L, yawing, manual automatisms L		EEG with strip and depth electrodes: temporopolar to temporolaterobasal L	Anterior temporal lobectomy 1/2010/ DCM/HS	I
16	38/F	LTLE L	DCM L T	Behavioral arrest, blinking, head turning to the R, SG		EEG with strip and depth electrodes: seizure onset temporo-posterior basal L	Lesionectomy temporal L 8/2010	I

Note:—R indicates right; L, left; Op, operation; DCM, malformation of cortical development; N, normal; tmp, temporopolar; HS, hippocampal sclerosis; sAHE, selective amygdalohippocampectomy; PLE, parietal lobe epilepsy; FLE, frontal lobe epilepsy; SG, secondarily generalized seizure.

On-Line Appendix

This supplemental material is based on the procedures published by Jann et al.[1]

EEG Setup and Recording

Ninety-two MR imaging–compatible silver chloride EEG electrodes fixed on an elastic cap were placed on the patient's scalp according to the international 10–10 system. Electrodes were connected to 3 BrainAmp MR imaging–compatible amplifiers (Brain Products, Gilching, Germany). EEG was recorded at a sampling rate of 5 kHz and bandpass-filtered (0.1–250 Hz) (input range, 16. 3 mV; recording reference, Fz). Two consecutive EEG sets were recorded, the first outside (10 minutes) and the second inside the MR imaging scanner during simultaneous fMRI acquisition (16 minutes). During the scans, patients were positioned in a regular 4-channel head coil with special foam that minimized head motion and discomfort due to electrodes and ear plugs

MR Imaging Setup and Data Acquisition

MR imaging was performed with a 3T Magnetom Trio TIM system (Siemens). High-resolution T1-weighted datasets were recorded for anatomic coregistration (magnetization-prepared rapid acquisition of gradient echo: 176 sagittal sections, isovoxel resolution = 1.0 mm, FOV = 256 mm × 256 mm, matrix size = 256 × 256, TR/TE = 1950/2.6 ms). fMRI was performed with a multisection single-shot T2*-weighted echo-planar imaging sequence (32 sections, section thickness = 3 mm, gap thickness = 0.75 mm, flip angle = 90°, FOV = 192 × 192 mm, matrix size = 64 × 64, TR/TE = 4130/30 ms) for patients 1–5 and 11. Since June 2008, an optimized continuous fMRI protocol was used with the optimized sequence parameters: TR/TE = 1980/30 ms, matrix = size 64 × 64 mm, FOV = 92 × 192 mm, flip angle = 90°) with a total of 460 volumes (patients 6–10 and 12–16).

MR Imaging Preprocessing

Analysis of the MR imaging data was performed by using BrainVoyagerQX 1.10.2. (Brain Innovation, Maastricht, the Netherlands). Preprocessing included the section-scan correction, removal of low-frequency drifts, 3D motion detection and correction, and spatial smoothing with a Gaussian kernel of 6-mm FWHM. Coregistration of the 2D functional to the 3D structural images was performed by using the section position parameters of the $T2^*$-weighted measurements and the T1-weighted anatomic measurements of the scanner.

EEG Preprocessing

EEGs recorded during the MR imaging sessions were postprocessed by using Vision Analyzer software (Version 1.05, Brain Products). Scan pulse artifacts correction was performed with average artifacts subtraction,[2-4] followed by bandpass-filtering (1–30 Hz) to remove the remaining high-frequency artifacts and down-sampling to 500 Hz.

ICA-Based EEG Predictor for fMRI Data

The EEGs recorded outside and inside the MR imaging scanner were concatenated and decomposed into ICs, applying an extended infomax independent component analysis algorithm.[5] The resulting ICs were visually inspected by 2 experienced electroencephalographers/neurophysiologists (R.W., M.H.), taking into account their temporal dynamics (ie, epileptiform activity in the ICs was identified at the corresponding time points and scalp distributions, as IEDs, in the original EEG and their specific scalp map [weighting of IC-factor onto the single electrodes]). [6] The most representative IC was then selected by consent and convolved with a standard double-γ hemodynamic response function (hemodynamic response function = $\gamma 1 / \max(\gamma 1) - \text{dip} \times \gamma 2 / \max(\gamma 2)$, scaled so that its total integral is zero (positive peak/FWHM, 5.4/5.2 seconds; negative peak/FWHM, 10.8/7.35 seconds; coefficient of the negative dip, 0.35). The representative IC factor was used as a predictor for the fMRI BOLD signal in the correlation estimation.

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