Epilepsy Research (2008) **82**, 177—182

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

History and seizure semiology in distinguishing frontal lobe seizures and temporal lobe seizures

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Received 22 April 2008; received in revised form 28 July 2008; accepted 10 August 2008
Available online 19 September 2008

KEYWORDS
Frontal lobe epilepsy;
Seizures;
Semiology;
Temporal lobe epilepsy

Summary This study aimed to determine the reliability of clinical history and seizure semiology for distinguishing between frontal lobe seizures (FLS) and temporal lobe seizures (TLS). FLS patients ($n=23$) were consecutively identified through an epilepsy surgery database. TLS patients ($n=27$) were selected randomly from 238 patients who had undergone temporal lobe surgery for epilepsy. The criterion standard for seizure localization was the location of resective epilepsy surgery that controlled seizures for a minimum of 2 years. Blinded comparisons of 13 historical information items (HII) and 19 video-recorded semiologic features (VSF) were made. We identified 3 HII (sex, history of febrile convulsions, and history of generalized tonic—clonic seizures) and 2 VSF (fencing posturing and postictal confusion) that significantly distinguished between FLS and TLS. The multivariate analysis model correctly identified 87% of FLS patients and 74% of TLS patients. No single HII or VSF is sufficient for distinguishing between FLS and TLS. A model integrating multiple HII and VSF may assist in this differentiation, but some patients still may be misclassified.

Introduction

Epileptic seizures are classified on the basis of clinical and electroencephalographic (EEG) features of seizure episodes (Commission on Classification and Terminology of the International League Against Epilepsy, 1981). The reliability of clinical features for distinguishing between frontal lobe seizures (FLS) and temporal lobe seizures (TLS) has not been assessed rigorously. We studied a cohort of patients whose seizure origin had been correctly determined by the location of resective epilepsy surgery that controlled seizures. Our objective was to determine whether historical

Abbreviations: EEG, electroencephalographic; FLS, frontal lobe seizure(s); HII, historical information item(s); TLS, temporal lobe seizure(s); VSF, video-recorded semiologic feature(s).

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doi:10.1016/j.eplepsyres.2008.08.004

information and video-recorded seizure semiology could be used to reliably distinguish between FLS and TLS.

Methods

Patients

The study was approved by the Mayo Clinic Institutional Review Board. FLS patients were identified from a database of 68 patients who had undergone frontal lobe epilepsy surgery at Mayo Clinic (Rochester, Minnesota) between 1987 and 1994. After reviewing the medical records, we identified 27 consecutive FLS patients who had excellent post-surgical outcome by being seizure free for at least 2 years after surgery. Video recordings of seizures were available for all patients, but the recordings of 4 patients were insufficient for the purpose of this study.

TLS patients were selected randomly from a database of 238 patients who had undergone anterior temporal lobectomy and amygdalohippocampectomy between 1987 and 1994 to control medically intractable epilepsy. The 27 TLS patients enrolled in the study had been seizure free for at least 2 years after surgery.

Historical information items and video-recorded semiologic features

Medical records of the study patients were reviewed without knowledge of the video-recorded seizures to determine the historical information items (HII) (Table 1). To determine the 19 video-recorded semiologic features (VSF) (Table 2), 2 investigators (R.K.M. and J.W.B.) reviewed all seizures recorded during the pre-operative inpatient video-EEG monitoring sessions. The 19 VSF were the following:

1. Occurrence of aura.
2. Seizure during sleep.
3. Initial motionless stare (motionless and staring at the beginning of seizure).
4. Oral automatism (lip smacking, chewing, or swallowing).
5. Unilateral manual automatism (semipurposeful movements of hand).
6. Bimanual automatism (semipurposeful movements of both hands).
7. Bipedal automatism (semipurposeful movements of both lower limbs).
8. Vocalization (either language or non-language).
9. Dystonic extremity posturing (sustained contorted posturing of the extremity at the joints).
10. Fencing posturing (forced head turn to 1 side and lateral abduction and external rotation of the upper limb on that side, with or without flexion at the elbow).
11. Tonic limb posturing (limb stretched in marked extension).
12. Unilateral clonic activity (gross rhythmic twitching of 1 or both limbs on 1 side).
13. Early non-forced head turn (voluntary-like head turn past midline but not to shoulder, without visible nuchal or limb muscle contractions).
14. Forced head turn (chin elevated and head turned extremely to 1 side, with prominent nuchal muscle contractions).
15. Restless trunk movement (non-rhythmic, poorly coordinated, and hypermotor).
16. Secondary generalized convulsive activity.
17. Postictal confusion.
18. Postictal dysphasia (unable to name objects or to read, but able to follow simple commands).
19. Postictal motor paresis (Todd paresis).

Reviewers were blinded to all clinical, imaging, and EEG data of the patients and did not know the results of each other's review. The 2 primary reviewers determined the duration of seizure, initial motionless staring, and oral automatism. They also measured latency from seizure onset to the appearance of VSF (Table 3).

Table 1 Historical information items of patients with frontal lobe seizures or temporal lobe seizures

Historical information item	Frontal lobe seizure patients ($n = 23$)[a]	Temporal lobe seizure patients ($n = 27$)[a]	*P* value
Age at surgery, *y*	31 (7—49)	31 (7—44)	.66
Sex			
Female	6 (26.1%)	17 (63.0%)	.01
Male	17 (73.9%)	10 (37.0%)	
Prior CNS insult[b]	13 (56.5%)	15 (55.6%)	>.99
Age at insult, *y*	12 (0—34)	2 (0—21)	.04
Major head trauma[c]	11 (47.8%)	5 (18.5%)	.04
History of febrile convulsions	0 (0%)	9 (33.3%)	.002
Family history of epilepsy	1 (4.3%)	0 (0%)	.46
Age at epilepsy onset, y	12 (1—35)	7 (1—26)	.31
At least 1 year of remission after epilepsy onset	8 (34.8%)	5 (18.5%)	.22
Presence of auras	10 (43.5%)	19 (70.4%)	.08
History of generalized convulsive seizures	21 (91.3%)	18 (66.7%)	.046
History of status epilepticus	2 (8.7%)	2 (7.4%)	>.99
Pre-surgical seizure frequency score[d]	8 (6—11)	8 (7—9)	.31

[a] Continuous data are presented as median (range). Categorical data are presented as number (percent of sample).
[b] Insults included stroke, meningo-encephalitis, perinatal asphyxia, and major head trauma.
[c] Resulting in loss of consciousness or intracranial hemorrhage.
[d] Seizure frequency scoring system (So et al., 1997).